Texas GulfLink, LLC
Texas GulfLink Project

Initial Minor Permit Application for Deepwater Port Facility

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CK Project No. 17073

May 2019
Revised December 2019
Revised April 2022

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1.0 INTRODUCTION

Texas GulfLink, LLC plans to develop the Texas GulfLink Deepwater Crude Export Terminal project ("Project"), a proposed deepwater crude oil export terminal, located near Freeport, Texas, in Brazoria County. The Project will provide critical infrastructure to the Houston market to clear over supplied crude oil volumes from West Texas and the Midcontinent. As United States crude oil exports continue to increase, critical infrastructure along the Gulf Coast will be necessary to provide an efficient and safe solution for large-scale exporting to international markets. The completed facility will be capable of fully loading Very Large Crude Carrier (VLCC) vessels for the purpose of exporting crude oil to international markets.

1.1 Project Description

The Texas GulfLink Terminal Project will construct a Deepwater Oil Port near Freeport, Texas, capable of loading deep draft VLCC vessels. The Deepwater Port will deliver crude oil via an onshore crude pipeline to above-ground crude oil storage tanks. Upon nomination from the crude oil shipper, the oil will be transported to one of two floating Single Point Mooring (SPM) buoys in the Gulf of Mexico, approximately 26.6 nautical miles (30.6 miles) offshore, via a 42-inch pipeline. The SPM buoys will allow for VLCC vessels to moor and receive up to 2 million barrels of crude oil each to be transported internationally. VOC vapors from VLCC loading will be controlled up to 98% reduction. A manned offshore platform, equipped with round-the-clock port monitoring, custody transfer metering, and surge relief will provide assurance that shippers' commercial risks are mitigated and that the port is protected from security threats and environmental risks.

The Deepwater Port *offshore* facility will consist of the following assets:

- One 42-inch outside diameter, 26.6 nautical mile long crude oil pipeline will be constructed from the shoreline crossing in Brazoria County, Texas, to the Texas GulfLink Deepwater Port, for crude oil delivery. The pipeline, in conjunction with 12.3 statute miles of new-build 42-in onshore pipeline, will connect the onshore crude oil storage facility and pumping station (Jones Creek Crude Storage Terminal) to the offshore Texas GulfLink Deepwater Port. The crude oil will be metered departing the onshore terminal as it leaves the tank and again at the offshore platform, providing custody transfer and line surveillance.
- One fixed offshore platform structure, with 4 piles, located in the Galveston Outer Continental Shelf lease block 423, approximately 26.6 nautical miles off the coast of Brazoria County, Texas, in a water depth of approximately 105 feet. The fixed platform will be constructed with three decks, including generators, pig receivers, lease automatic custody transfer (LACT) unit, oil displacement prover loop, living quarters, electrical and instrumentation building, portal cranes, helideck, and a vessel traffic control room utilizing a state-of-the-art radar system.

- The Deepwater Port will utilize two (2) Single Point Moring (SPM) buoys, each having:
    - Two (2) 24-inch inside diameter crude oil subsea hoses interconnecting with the crude oil pipeline end manifold (PLEM)
    - Two (2) 24-inch inside diameter floating crude oil hoses connecting the moored VLCC or other crude oil carrier for loading to the SPM buoy – The floating hoses will be approximately 1,100 feet in length and rated for 285 psig. Each floating hose will contain an additional 200 feet of 16-inch "rail tail hose" designed to be lifted and robust enough for hanging over the edge railing of the VLCC or other crude oil carrier. The subsea hoses will be approximately 160 feet in length and rated for 285 psig.
- Two (2) PLEMs will provide the interconnection between the pipelines and the SPM buoys. Each SPM buoy will have one (1) PLEM for crude oil export. Each crude oil loading PLEM will be supplied with crude oil by one (1) 42-inch outside diameter pipeline, each approximately 1.25 nautical miles in length.
- VOC emissions resulting from VLCC loading will be controlled by using an Offshore Service Vessel (OSV) that will contain a vapor processing module. For the entire duration of VLCC loading, the VRV will be positioned alongside the VLCC, and a flexible hose will connect the VLCC's vapor manifold to the VRV's vapor processing module. The vapor processing module will compress and condense the VOC vapor to produce liquid-VOC (L-VOC) and surplus-VOC (S-VOC). The L-VOC will be stored in pressure tanks and the S-VOC may be used as fuel for onboard gas turbine generators. After 2 VLCC loads, the L-VOC tanks will be nearly full, the VRV will head to port to offload the tanks, then return to the Deepwater Port for continued VLCC loading.

The Deepwater Port *onshore* project components will consist of the following:

- New installed 9.45 miles of 36" pipeline from the Department of Energy (DOE) facility at Bryan Mound to the Texas GulfLink Jones Creek Crude Storage Terminal.
- The proposed Jones Creek Crude Storage Terminal located in Brazoria County, Texas, on approximately 200 acres of land consisting of twelve (12) above-ground domed external floating roof (DEFR) storage tanks, with a site-wide maximum storage capacity of approximately 8.5 million barrels of "sweet" crude oil.
- The Jones Creek Terminal will also include:
    - Six (6) electric-driven mainline crude oil pumps
    - Three (3) electric driven booster crude oil pumps
    - One (1) crude oil pipeline pig launcher
    - One (1) crude oil pipeline pig receiver
    - Two (2) measurement skids for measuring crude oil – one (1) skid located at the incoming pipeline from the Bryan Mound facility and one (1) skid installed for the outgoing crude oil barrels leaving the tank storage to be loaded on the VLCC
    - Ancillary facilities, to include an operations control center, electrical substation, offices, and warehouse building.

1.2 Purpose

Texas GulfLink, LLC respectfully submits this initial minor source permit application to authorize air pollutant emissions from the proposed offshore Deepwater Port, which is part of the Texas GulfLink Project. Because Texas is the nearest state to the proposed project, this air permit application follows the requirements of the Texas Commission on Environmental Quality (TCEQ) air permitting program for new construction, under Title 30 of Texas Administrative Code (30 TAC) Chapter 116, Subchapter B. For sources located outside of the state seaward boundary on the Outer Continental Shelf, the US EPA administers the New Source Review permit program. Therefore, Texas GulfLink, LLC is submitting this initial minor source permit application to the US EPA (Region 6).

During normal operation of the Deepwater Port, pollutant emissions generated will include carbon monoxide (CO), nitrogen oxides (NOx), particulate matter with mean aerodynamic diameters less than or equal to 10 microns/2.5 microns (PM_{10}/$PM_{2.5}$), sulfur dioxide (SO_2), greenhouse gases (GHG), expressed as carbon dioxide equivalent (CO_2e), and volatile organic compounds (VOC) with speciated Hazardous Air Pollutants (HAPs), such as benzene. Total facility-wide emission rates are summarized in Tables 3-1 and 3-2 of Section 3.0 of this application.

This permit application contains information sufficient to demonstrate compliance with applicable requirements outlined in 30 TAC 116. This information includes a description of the Deepwater Port facility, including the two SPMs and Offshore Service Vessel (OSV) vapor recovery system, emission rate calculation (methods and calculation spreadsheets), a TCEQ state Best Available Control Technology (state-BACT), an off-property impacts analysis, and federal and state air regulations applicability review.

1.3 Area Map

Figure 1 in Appendix A is an area map showing the proposed Texas GulfLink Deepwater Port facility to be located approximately 26.6 nautical miles offshore the coast of Brazoria County, Texas. As shown in the map, the proposed facility will consist of the fixed platform and two Single Point Mooring (SPM) buoys for loading the VLCCs. Additionally, the facility will consist of an OSV containing a vapor processing module that will connect to the VLCC during loading operations.

2.0 PROCESS DESCRIPTION

As described in detail in Section 1.1 of this application, the proposed Texas GulfLink Deepwater Port facility will consist of a permanently manned offshore platform with two associated single point mooring (SPM) buoys for the loading of Very Large Crude Carriers (VLCCs). Sweet crude oil, with a maximum Reid Vapor Pressure (RVP) of 10 psi, will be pumped via pipeline from the onshore Jones Creek Crude Storage Terminal to the Deepwater Port facility to be loaded into the VLCC vessels. An Offshore Service Vessel (OSV) will be positioned alongside the VLCCs during loading to capture and compress VOC emissions resulting from crude oil loading. Air pollutant emissions from Deepwater Port facility operation will result from the following emission sources (Emission Point Number, EPN, given):

VLCC Loading

- VOC emissions from marine loading of crude oil into VLCCs [EPN (P) M-1]. Up to 98% of these emissions will be recovered and processed by a vapor processing module on board an OSV stationed alongside the VLCC during loading.

Offshore Service Vessel (OSV)

- Combustion emissions from 2 non-emergency gas-fired turbine generators associated with the vapor processing module [EPNs (OSV) GT-1 and (OSV) GT-2].
- Combustion emissions from 2 back-up non-emergency diesel-fired electric generators associated with the OSV [EPNs (OSV) EDG-1 and (OSV) EDG-3].
- Fugitive VOC emissions from vapor processing module piping [EPN (OSV) F-1].
- Fugitive VOC emissions from VLCC/OSV hose disconnects [EPN (OSV) F-2].
- VOC emissions from uncontrolled VLCC loading due to bad weather [EPN (OSV) UM-1].
- VOC emissions from other miscellaneous maintenance activities (e.g. filter changes, clearing vapor module lines, etc.) [EPN (OSV) MSS-2].

Stationary Platform

- Combustion emissions from 2 diesel electric generator engines [EPNs (P) G-1 and (P) G-2]
- Combustion emissions from 1 diesel portal crane engine [EPN (P) C-1]
- VOC emissions from 1 fixed roof tank storing diesel fuel [EPN (P) DT-1]
- VOC emissions from 4 “belly” tanks (i.e., diesel fuel tanks for the electric generator, FWP, and crane engines) [(P) BT-1, BT-2, BT-3, and BT-4]
- VOC emissions from 1 fixed roof crude oil surge tank [EPN (P) T-1]
- Combustion emissions from 1 diesel emergency firewater pump engine [EPN (P) FWP-1]
- VOC emissions from pipeline pigging operations [EPN (P) P-1]
- Fugitive VOC emissions from the platform piping components [EPN (P) F-1]
- Fugitive VOC emissions from piping components on 2 SPM loading buoys [EPN (P) F-2]
- VOC emissions from crude oil sampling activities [EPN (P) S-1]
- VOC emissions from pump maintenance [EPN (P) PM-1]
- VOC/PM emissions from maintenance-related abrasive blasting/painting [EPN (P) MSS-1]

A summary of each EPN, its description, and expected pollutants is presented in Table 2-1.

Table 2-1: Summary of Emission Sources at Deepwater Port Facility

EPN *	Description	Pollutant
VLCC Loading		
(P) M-1	Marine loading into VLCCs (controlled)	VOC **
OSV		
(OSV) GT-1	Gas-fired electric generator engine (non-emergency)	Combustion ***
(OSV) GT-2	Gas-fired electric generator engine (non-emergency)	Combustion
(OSV) EDG-1	Diesel-fired electric generator engine (non-emergency)	Combustion
(OSV) EDG-3	Diesel-fired electric generator engine (non-emergency)	Combustion
(OSV) F-1	Fugitives from vapor processing module piping leaks	VOC
(OSV) F-2	Fugitives from hose disconnects	VOC
(OSV) UM-1	Uncontrolled VLCC loading due to bad weather	VOC
(OSV) MSS-2	Other miscellaneous maintenance activities (*MSS activity*)	VOC
Platform		
(P) G-1	Diesel-fired electric generator engine (non-emergency)	Combustion
(P) G-2	Diesel-fired electric generator engine (non-emergency)	Combustion
(P) C-1	Diesel-fired portal crane engine	Combustion
(P) DT-1	Day tank storing diesel fuel (fixed roof)	VOC
(P) BT-1	Belly Tank 1	VOC
(P) BT-2	Belly Tank 2	VOC
(P) BT-3	Belly Tank 3	VOC
(P) BT-4	Belly Tank 4	VOC
(P) T-1	Crude oil surge tank (covered)	VOC
(P) FWP-1	Diesel-fired emergency firewater pump engine (*MSS activity*)	Combustion
(P) P-1	Pipeline pigging operations (*MSS activity*)	VOC
(P) F-1	Fugitives from platform piping component leaks	VOC
(P) F-2	Fugitives from SPM piping component leaks	VOC
(P) S-1	Crude oil sampling activities	VOC
(P) PM-1	Routine pump maintenance (*MSS activity*)	VOC
(P) MSS-1	Abrasive Blasting/Painting (*MSS activity*)	VOC, $PM_{10}/PM_{2.5}$

* (P) stands for Platform and (OSV) stands for Offshore Service Vessel

** VOC emissions include speciated hazardous air pollutants (HAPs) such as benzene

*** Combustion pollutants are NOx, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, GHG (CO_2e), and un-combusted VOC

A simplified process flow diagram illustrating the offshore Deepwater Port's process is provided as Figure 2 and included in Appendix A of this application.

3.0 EMISSION RATE CALCULATION METHODS

In this section, the emissions rate calculation methods used to estimate maximum pollutant emissions from the proposed Deepwater Port Facility operations are described. Operation of the offshore facility will result primarily in emissions of volatile organic compounds (VOC) and oxides of nitrogen (NOx). Lesser amounts will be emitted of sulfur dioxide (SO_2), carbon monoxide (CO), hydrogen sulfide (H_2S), particulate matter (PM), including PM with an aerodynamic diameter of 10 microns or less (PM_{10}) and 2.5 microns or less ($PM_{2.5}$), and hazardous air pollutants (HAPs). Greenhouse gas (GHG) emissions, expressed as carbon dioxide equivalent (CO_2e), were also addressed. Maximum hourly (pounds per hour, lb/hr) and annual average (tons per year, tpy) emission rates were estimated for each source of emissions. The emissions are on a Potential-to-Emit (PTE) basis. A summary of the site-wide total annual rates for criteria and GHG pollutants is given in Table 3-1 below. A summary of site-wide total annual hydrogen sulfide (H_2S) and HAP emission rates is given in Table 3-2 below. Detailed emission rate calculations are provided in Appendix B of this application.

Note that only those offshore pollutant emissions associated with the Deepwater Port Facility that can be permitted are addressed in this minor source permit application. Other offshore emissions associated with the Texas GulfLink Project, including those from construction and "indirect" sources (e.g. tug/pilot boats, other vessels, etc.), are not included in this permit application, but are addressed in the Emission Impacts Analysis section of the Deepwater Port license application

3.1 Emissions Summary

Table 3-1 summarizes the site-wide total annual PTE emission rates of the "criteria" and greenhouse gas (CO_2e) pollutants for the proposed Deepwater Port Facility. As shown in the table, no PSD-regulated pollutant will be emitted at a rate greater than or equal to the PSD major source threshold of 250 tpy. Therefore, the entire Deepwater Port project is considered minor with respect to PSD. Note that total VOC is less than 250 tpy primarily because VOC emissions from VLCC loading will be recovered using a vapor processing module on board an OSV positioned alongside the VLCC. Without the recovery of VOC emissions from VLCC loading, the site would be considered major. Therefore, the site is a "synthetic" minor facility with respect to PSD.

Per the Title V regulations under 40 CFR 71.2 (Definitions), a stationary source of emissions is major under Title V if it has annual PTE emissions equaling or exceeding any of the following thresholds:

1. 100 tons per year (tpy) of a regulated air pollutant (except GHGs);
2. 10 tpy of an individual Hazardous Air Pollutant (HAP); or
3. 25 tpy of any combination of total HAPs.

Table 3-1: Summary of Annual Criteria and GHG PTE Rates for Deepwater Port Facility

EPN *	Source	CO_2e	PM_{10}	$PM_{2.5}$	SO_2	NOx	CO	Total VOC
		(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
(P) M-1	Marine Loading							208.10
(P) G-1	Generator 1	2,428	0.70	0.70	0.03	21.72	12.20	0.58
(P) G-2	Generator 2	2,428	0.70	0.70	0.03	21.72	12.20	0.58
(P) C-1	Crane 1	2,132	0.61	0.61	0.02	11.32	10.71	0.92
(P) DT-1	Day Tank 1							0.01
(P) BT-1	Belly Tank 1							0.001
(P) BT-2	Belly Tank 2							0.001
(P) BT-3	Belly Tank 3							0.001
(P) BT-4	Belly Tank 4							0.0001
(P) T-1	Surge Tank							1.74
(P) FWP-1	MSS - Emerg Firewater Pump Maintenance	20	0.01	0.01		0.11	0.10	0.01
(P) P-1	MSS - Pigging Operations							0.50
(P) F-1	Platform Fugitive Emissions							0.12
(P) F-2	SPM System Fugitives							0.44
(P) S-1	Sampling Activities							0.05
(P) PM-1	MSS - Pump Maintenance							0.002
(P) MSS-1	MSS - Abrasive Blasting / Painting		0.06	0.01				0.26
(OSV) UM-1	Uncontrolled Marine Loading (Bad Weather)							31.03
(OSV) GT-1	GT Generator 1	3,860	1.31	1.31	0.19	8.16	6.21	0.98
(OSV) GT-2	GT Generator 2	3,860	1.31	1.31	0.19	8.16	6.21	0.98
(OSV) EDG-1	CAT 3516C - No. 1	5,642	1.46	1.46	0.054	45.44	25.51	1.21
(OSV) EDG-3	CAT 3512C - No. 1	1,018	0.21	0.21	0.008	6.40	3.59	0.17
(OSV) F-1	OSV Fugitive Emissions							0.11
(OSV) F-2	OSV Fugitive Emissions - Hose Disconnects							0.03
(OSV) MSS-2	MSS - Other Misc. Maintenance							0.81
	TOTAL EMISSIONS (TPY)	**21,388**	**6.37**	**6.31**	**0.51**	**123.04**	**76.73**	**248.64**

* P stands for Platform and OSV stands for Offshore Service Vessel

The facility-wide PTE emission rates shown in Table 3-1 indicate that the Deepwater Port Facility will be subject to Title V air permitting because VOC and NOx will each exceed the 100 tpy major source threshold. However, the facility will be considered minor with respect to Title V for all other non-HAP pollutants because their emission rates will all be under the 100 tpy major source threshold. GHG emissions, expressed as carbon dioxide equivalent (CO_2e), will be less than 100,000 tpy; therefore, the facility will be considered minor for Title V with respect to GHG.

Table 3-2 summarizes the site-wide total annual (tpy) PTE emission rates of H_2S and HAP pollutants for the proposed Deepwater Port Facility. As described above, the major source threshold for HAPs is 10 tpy for an individual HAP or 25 tpy of the aggregate of all HAPs. As shown in Table 3-2, no individual HAP will have an emission rate greater than or equal to 10 tpy. Additionally, the aggregate total emission rate from all HAPs is approximately 7.7 tpy, which is less than 25 tpy. Therefore, the proposed Deepwater Port Facility is considered minor with respect to HAPs. As described in Section 6.0 of this application, the applicability of federal and state air quality rules was determined based upon the Deepwater Port Facility being considered a minor ("area") source for HAPs.

Table 3-2: Summary of Annual H_2S and HAP PTE Rates for Deepwater Port Facility

EPN *	Source	H_2S (tpy)	1,3-Butadiene (tpy)	Acetaldehyde (tpy)	Acrolien (tpy)	Benzene (tpy)	Isopropyl benzene (tpy)	Ethylbenzene (tpy)	Formaldehyde (tpy)	Hexane (-n) (tpy)	Naphthalene (tpy)	PAH (tpy)	Propylene Oxide (tpy)	2,2,4-Trimethylpentane (isooctane) (tpy)	Toluene (tpy)	Xylene (-m) (tpy)
(P) M-1	Marine Loading	0.0012				0.92	0.01	0.06		4.75				0.08	0.45	0.18
(P) G-1	Generator 1			0.001		0.02			0.002						0.01	0.01
(P) G-2	Generator 2			0.001		0.02			0.002						0.01	0.01
(P) C-1	Crane 1								0.02							
(P) DT-1	Day Tank 1															
(P) BT-1	Belly Tank 1															
(P) BT-2	Belly Tank 2															
(P) BT-3	Belly Tank 3															
(P) BT-4	Belly Tank 4															
(P) T-1	Surge Tank					0.01		0.001		0.04					0.004	0.002
(P) FWP-1	MSS - Emerg Firewater Pump Maintenance															
(P) P-1	MSS - Pigging Operations					0.002				0.01					0.001	
(P) F-1	Platform Fugitive Emissions					0.00071				0.002					0.001177	0.002
(P) F-2	SPM System Fugitives															
(P) S-1	Sampling Activities															
(P) PM-1	MSS - Pump Maintenance															
(P) MSS-1	MSS - Abrasive Blasting / Painting															
(OSV) UM-1	Uncontrolled Marine Loading (Bad Weather)	0.0002				0.14	0.001	0.01		0.71				0.01	0.07	0.03
(OSV) GT-1	GT Generator 1		0.00002	0.002	0.0003	0.0006		0.002	0.038		0.0001	0.0001	0.002		0.007	0.003
(OSV) GT-2	GT Generator 2		0.0000	0.0022	0.0003	0.001		0.0017	0.038		0.000	0.000	0.0016		0.007	0.003
(OSV) EDG-1	CAT 3516C - No. 1			0.0008		0.024			0.002						0.009	0.006
(OSV) EDG-3	CAT 3512C - No. 1			0.0001		0.003			0.000						0.001	0.001
(OSV) F-1	OSV Fugitive Emissions	0.000001				0.001	0.0001	0.0004		0.002				0.0001	0.001	0.002
(OSV) F-2	OSV Fugitive Emissions - Hose Disconnects	0.0000002				0.0002	0.000001	0.00001		0.001				0.00001	0.0001	0.00003
(OSV) MSS-2	MSS - Other Misc. Maintenance															
	TOTAL EMISSIONS (TPY)	**0.001**	**0.000**	**0.007**	**0.0007**	**1.141**	**0.008**	**0.075**	**0.099**	**5.516**	**0.0001**	**0.0002**	**0.0031**	**0.091**	**0.559**	**0.237**

* P stands for Platform and OSV stands for Offshore Service Vessel

3.2 Marine Loading [EPN (P) M-1]

Crude oil will be loaded into VLCCs at the Deepwater Port at a proposed annual rate of 365 million barrels per year (bbl/yr). The maximum hourly rate (lb/hr) for crude loading will be 85,000 bbl/hr. Uncontrolled VOC emissions from loading were estimated using EPA emission factors from AP-42, Chapter 5, Section 5.2. Equation (2) in this section was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges. Up to 98% of the VOC vapors from the VLCC due to crude loading will be captured and routed to a vapor processing module onboard the Offshore Service Vessel positioned alongside the VLCC.

Based upon expected crude oil slates, a Reid Vapor Pressure (RVP) of 10 psi was assumed for the marine loading emission rate calculations. The maximum and average H_2S concentrations in the sweet crude were assumed to be 25 parts per million by volume (ppm_v) and 5 ppm_v, respectively. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program and then modified for site-specific assays to include n-hexane as a speciated HAP. The VLCC

3.3 Offshore Service Vessel (OSV) Emission Sources

3.3.1 Gas-Fired Electric Generator Engines [EPNs (OSV) GT-1 and (OSV) GT-2]

Two 1,800 kilowatt (KW) non-emergency gas turbine (GT) electric generators will be installed on the OSV along with the vapor recovery system (processing module). These GT generators will be used to supply electricity to the OSV's main buss. Exhaust gas heat from the GTs will be recovered for a water/glycol heating system used for vapor processing module drier regeneration and L-

VOC vaporization. A dedicated heat recovery unit will be installed on the exhaust of each GT. The 2 GTs will be combined-cycle GTs. The two diesel electric generators on the OSV (described next) will operate in backup mode to the two GT generators during VLCC loading. Fuel for the GT generators will consist of L-VOC only at loads less than 90%, and a 60/40 mixture of L-VOC/S-VOC when the generators are at 90% load. The generators will operate at 90% load for the entire time of VLCC loading (approximately 33 hours). For the approximate 1 hour time for connecting the transfer hose from the VLCC to the OSV, the GT generators will operate at less than 90% load. The generators can operate at 100% load, but this would only be for very short duration spikes in operation (e.g. during generator startup). The startup time for the GT generators will be very short, on the order of 5 to 8 minutes.

Pollutant emissions were conservatively estimated assuming the 2 generators operate at 90% load for the entire 34 hours (i.e., 1 hour for hose connection and 33 hours for VLCC loading). Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from the GT generator manufacturer (OPRA Turbines) based on 15% O_2 correction. Maximum SO_2 emissions were estimated using EPA's AP-42 emission factor in Table 3.2-2a for natural gas combustion. Maximum greenhouse gas emissions, expressed as CO_2e, were estimated using the emissions factors for natural gas and the CO_2, CH_4, and N_2O factors from Tables C-1 and C-2 of 40 CFR 98 Subpart C, and the global warming potentials of these compounds from Table A-1 of 40 CFR 98, Subpart A.

3.3.2 Diesel-Fired Electric Generator Engines [EPNs (OSV) EDG-1 and (OSV) EDG-3]

There will be a total of 4 non-emergency diesel-fired generators on the OSV: 2 Caterpillar 3516C generators at 2,000 kW each and 2 Caterpillar 3512C generators at 1,700 kW each. These generators will also supply electricity to the OSV. However, only 2 generators will operate at a time (one Cat 3516C and one Cat 3512C) during VLCC loading. Therefore, for permitting purposes, emissions from only the 2 operating generators were included in the emission rate calculations. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG (CO_2e) were obtained from 40 CFR 98, Tables C-1 and C-2, assuming natural gas combustion.

3.3.3 Fugitive Emissions from Vapor Processing Module [EPN (OSV) F-1]

Small fugitive VOC emissions will result from assumed emission leaks from vapor processing module piping components such as valves and connectors (flanges). Emission factors from TCEQ's guidance document, *Air Permit Technical Guidance for Chemical Sources – Fugitive Guidance* (APDG 6422, June 2018), were used to estimate VOC emissions. Specifically, the "Petroleum Marketing Terminal" (PMT) factors from Table II of the document were used, which factors assume a 28 PET leak detection and repair (LDAR) program will be implemented. The PMT emission factors were chosen based on the TCEQ's memo dated 12/5/2005 allowing these factors for equipment components in pipeline breakout stations for crude oil and fuel service (gasoline, diesel, and jet fuel). The proposed Texas GulfLink *onshore* tank terminal is a pipeline breakout station, and the crude oil from that facility is transferred directly to the offshore platform for loading into the VLCCs. So, the crude oil vapors collected from VLCC loading by the OSV vapor processing module will be vapors from a crude pipeline breakout station.

The 28PET leak detection and repair (LDAR) program involves an audio, visual, and olfactory (AVO) inspection of the module piping. An emissions control credit is included in the emission factors, so no other control credits were applied.

For the emission calculations, based on vapor pressure, condensed crude oil vapor (L-VOC and S-VOC) is assumed to be a "Light Liquid". The total VOC emission rate was obtained by multiplying the count of a particular component (e.g. valve) by the component's emission factor in Light Liquid service, then summing the emissions from all components. To be conservative, the gas/vapor emission factor was used for those piping components not addressed by Table II in the TCEQ guidance document. The average H_2S concentration in sweet crude was assumed to be 5 ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program, and then modified for site-specific assays to include n-hexane as a speciated HAP.

3.3.4 Fugitive Emissions from Hose Disconnects [EPN (OSV) F-2]

Small fugitive VOC emissions will result from disconnecting the 16-inch flexible hose between the VLCC and the OSV vapor processing module. Although the flexible hose will be approximately 250 feet long, only the 2 feet at the end of the hose at the connection point would release a small amount of vapor upon disconnect before the hose is flushed with nitrogen back to the VLCC crude oil storage hold.

VOC emissions were estimated by, first, calculating the actual volume inside of the 2 foot long hose section, using the inside diameter and length of the section. Because the hose will be under pressure (1 psig) when disconnected, it is assumed that the entire volume of gas inside the hose section will be emitted to atmosphere. In the calculation, the volume of gas inside the hose (actual cubic feet) is corrected to standard volume (standard cubic feet).

VOC emissions were calculated by dividing the standard volume (scf) of the hose vapor to the molal volume of an ideal gas (385.3 scf/lb-mol) to obtain the lb-mole of emitted vapor when the hose section is opened to the atmosphere. Then, to obtain the mass rate, the vapor molecular weight of crude oil (50 lb/lb-mol) was multiplied to the lb-mole of emitted vapor. This calculation results in a mass rate per receiving event (lb/event). To obtain maximum hourly (lb/hr) and annual average (tpy) rates, it was assumed that a single hose disconnect event will last for a one hour, and that the maximum number of hose disconnects per year will be 180 events (i.e., 180 VLCC loads per year each having one hose disconnect).

3.3.5 Uncontrolled VLCC Loading Due to Bad Weather [EPN (OSV) UM-1]

Throughout the year, there may be occasions where a VLCC is being loaded and inclement weather arises that creates an unsafe loading condition. For such a situation, it is safer to disconnect the vapor collection hose between the VLCC and OSV, finish loading the VLCC, and have both the OSV and VLCC depart the Deepwater Port for a safer area. Such weather-driven evacuations are extremely rare, maybe once every 2 – 3 years. Nevertheless, VOC emissions were estimated for such a rare event. For this estimation, it was conservatively assumed that an unsafe loading event would occur three (3) times a year, and that each event would last a maximum six (6) hours. The same AP-42 marine loading calculation method used for normal (controlled) VLCC loading was used for this uncontrolled situation (i.e., emission factors from AP-42, Chapter 5, Section 5.2, Equation (2) for loading crude oil into ships).

3.3.6 Other Miscellaneous Maintenance Activities [EPN (OSV) MSS-2]

VOC emissions were estimated for miscellaneous maintenance activities of the equipment onboard the OSV (e.g. oil/filter changes, clearing vapor processing module lines, etc.). Oil/filter and other maintenance activity events are expected to occur every 60 days (or about 6 maintenance events per year), to last 4 hours per event, and emit 1 kg (2.2 lbs) of VOC per event. Module line clearing is expected to occur after each VLCC load (180 loads per year), last 1 hour per event, and emit 4 kg (8.8 lbs) of VOC per event.

3.4 Platform Emission Sources

3.4.1 Diesel-Fired Electric Generator Engines [EPNs (P) G-1 and (P) G-2]

Two 650 KW non-emergency electric generators will be used to supply electricity to the platform. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.4.2 Diesel-Fired Portal Crane Engine [EPNs (P) C-1]

A 425 hp (317 KW) portal crane will be used on the platform. Maximum emission rates for the combustion pollutants of NOx, CO, $PM/PM_{10}/PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 89.112(a) Table 1, as referenced by 40 CFR 60, NSPS IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The

SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG were obtained from 40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel).

3.4.3 Day Tank Storing Diesel Fuel [EPN (P) DT-1]

The Deepwater Port will include a fixed-roof tank used to store diesel fuel, with a storage capacity of 20,000 gallons. VOC emissions were calculated using U.S. EPA's TANKS 4.09d program. The throughput is proposed to be 300,000 gallons per year. The HAP speciation profile was obtained from the default speciation for diesel in the TANKS 4.09d program.

3.4.4 Belly Tanks Storing Diesel Fuel [EPNs (P) BT-1, BT-2, BT-3, BT-4]

VOC emissions were estimated from 4 "belly" tanks (i.e., tank is part of the equipment and not stand-alone) storing diesel fuel. These tanks are associated with the 2 electric generators, the portal crane, and the firewater pump. The belly tanks associated with the electric generators and portal crane are expected to have a maximum diesel throughput of approximately 100,000 gal/year. Because the firewater pump is emergency use only, the diesel fuel throughput for it was assumed much less, approximately 1,000 gal/year. The EPA's TANKS 4.09d program was used to estimate VOC emissions from all 4 tanks. The HAP speciation profile was obtained from the default speciation for diesel in the TANKS 4.09d program.

3.4.5 Crude Oil Surge Tank [EPN (P) T-1]

The proposed Deepwater Port will include one fixed roof tank used as a surge tank, with a storage capacity of 84,000 gallons. VOC emissions were calculated using U.S. EPA's TANKS 4.09d program. Based upon expected crude slates, a Reid Vapor Pressure (RVP) of 10 psi was assumed for the surge tank emission calculation. The throughput is proposed to be 84,000 gallons per year. The average H_2S concentration in the sweet crude was assumed to be 5 ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program and then modified for site-specific assays to include n-hexane as a speciated HAP.

3.4.6 Firewater Pump Engine [EPN (P) FWP-1]

The emergency-use firewater pump (FWP) engine will be started periodically to ensure its proper operation. Maximum emission rates for the combustion pollutants of NOx, CO, PM_{10}/$PM_{2.5}$, and un-combusted VOC were estimated using emission factors from 40 CFR 60, Subpart IIII, Table 4 [225<=kW<450 (300<=Hp<600)]. The PM factor in this table was used for both PM_{10} and $PM_{2.5}$. The NMHC + NOx factor in the table was used for VOC and NOx by assuming 92% NOx and 8% VOC, based on the ratio of the NOx to VOC AP-42 emission factors. The maximum emission rate for the combustion pollutant SO_2 was estimated using the emission factor from AP-42, Chapter 3.4 (for "large" stationary diesel-fired generators), Table 3.4-1. The SO_2 factor was obtained by multiplying the factor in the table (0.00809 lb/hp-hr) with S_1, which is the sulfur content in the fuel, in this case 15 ppm_v (0.0015%). Finally, the emission factors for GHG were obtained from

40 CFR 98, Tables C-1 and C-2, assuming Distillate Fuel Oil No. 2 (for diesel). The engine will be operated as part of reliability testing for no more than 100 hours per year. This reliability testing is considered a Maintenance, Startup, and Shutdown (MSS) activity.

3.4.7 Pipeline Pigging Operations [EPN (P) P-1]

VOC emissions will result from pipeline pigging operations at the offshore Deepwater Port. Emissions were estimated for pig launching and receiving using the worst-case operation as the emissions basis for the application. The volume (actual cubic feet) of each pig launcher and receiver was calculated based on the inside diameter and length. Because the receiver is at pressure (≤ 1 psig) before it is opened, the volume of gas inside (assumed to be entirely emitted to atmosphere) is corrected to standard volume (standard cubic feet).

VOC emissions were calculated by, first, dividing the standard volume (scf) of the chamber vapor to the molal volume of an ideal gas (385.3 scf/lb-mol) to obtain the lb-mol of emitted vapor when the chamber is opened to the atmosphere. Then, to obtain the mass rate, the vapor molecular weight of crude oil (50 lb/lb-mol) was multiplied to the lb-mol of emitted vapor. This calculation results in a mass rate per receiving event (lb/event). To obtain a maximum hourly rate (lb/hr) and annual average rate (tpy), it was assumed that a single pigging event will last for a half hour, and that the maximum number of pigging events per year will be 12 events.

3.4.8 Platform Fugitive Emissions [EPN (P) F-1]

Fugitive VOC emissions will result from assumed small emission leaks from piping components such as valves, connectors (flanges), and pump seals. Emission factors from TCEQ's guidance document, *Air Permit Technical Guidance for Chemical Sources – Fugitive Guidance* (APDG 6422, June 2018), were used to estimate VOC emissions. Specifically, the "Petroleum Marketing Terminal" (PMT) factors from Table II of the document were used, which factors assume a 28 PET leak detection and repair (LDAR) program will be implemented. The PMT emission factors were chosen based on the TCEQ's memo dated 12/5/2005 allowing these factors for equipment components in pipeline breakout stations for crude oil and fuel service (gasoline, diesel, and jet fuel). The proposed Texas GulfLink *onshore* tank terminal is a pipeline breakout station, and the crude oil from that facility is transferred directly to the offshore platform for loading into ships. So, the crude oil in the offshore platform piping is, by extension, oil from a crude pipeline breakout station.

The 28PET leak detection and repair (LDAR) program is specific to petroleum marketing terminals and involves an audio, visual, and olfactory (AVO) inspection of the above-ground pipeline system. An emissions control credit is included in the emission factors, so no other control credits were applied.

For the calculations, based on vapor pressure, crude oil is assumed to be a "Light Liquid". The total VOC emission rate was obtained by multiplying the count of a particular component (e.g. valve) by the component's emission factor in Light Liquid service, then summing the emissions from all components. The average H_2S concentration in the sweet crude was assumed to be 5

ppm_v. The HAP speciation profile was obtained from the default speciation for crude oil in the TANKS 4.09d program and then modified for site-specific assays to include n-hexane as a speciated HAP.

3.4.9 SPM System Fugitive Emissions [EPN (P) F-2]

Valves and flanges associated with the 2 Single Point Mooring (SPM) buoys are assumed to emit VOC. To estimate these emissions, emission factors were obtained from *Table 4, Average Emission Factors – Petroleum Industry (Oil & Gas Production Operations) of TCEQ's Addendum to RG-360A, Emission Factors for Equipment Leak Fugitives Components*, January 2008. Specifically, the factors for Oil and Gas Production Operations, for Light Oil > 20^o API were used because none of the emission factor source categories (i.e., for SOCMI, Oil and Gas Production, Refinery, or Petroleum Marketing Terminal) reasonably apply to an SPM system. The worst-case (highest) factors for the valves and flanges making up the two SPM systems were chosen, which were the Oil and Gas Production Operation factors for Light Oil > 20^o API. Note that use of these factors does not require a monthly AVO; therefore, Texas GulfLink does not plan to conduct an AVO inspection of the two SPMs. Light liquid emission factors were used, and emissions were conservatively estimated to be 100% VOC.

3.4.10 Crude Sampling Activities [EPN (P) S-1]

Crude oil assay quality testing will occur at the offshore platform. The crude oil will be sampled, and its physical and chemical properties will be determined for quality assurance. Very small VOC emissions will occur as a result of this sampling activity. To estimate VOC emissions, it was assumed that 1 sample would be taken each work shift, with 3 shifts per day. A VOC emission of 0.1 lb/sample was assumed.

3.4.11 Routine Pump Maintenance [EPN (P) PM-1]

The 4 proposed electric-driven crude oil pumps at the offshore platform will need periodic maintenance. Very small amounts of VOC emissions will result from opening and draining the pumps. The emissions were estimated assuming 1 lb of VOC will be emitted per maintenance event, and that there will be one maintenance event for each of the four pumps per year.

3.4.12 Abrasive Blasting / Painting [EPN (P) MSS-1]

The proposed offshore platform coatings will have a designed life of 20+ years. Sandblasting and recoating of the platform structure should not be required within this period, other than spot maintenance where coatings may be damaged by contact with metal objects such as hammers, wrenches, or scaffolding. However, to comply with NEPA requirements, potential maximum hourly (lb/hr) and annual average (tons/yr) emission rates were estimated for PM emissions from abrasive blasting and VOC emissions from painting.

For $PM_{10}/PM_{2.5}$ emissions from abrasive blasting, an application rate of 2,000 lb/hr was assumed. Per industry expertise and best management practices, it was assumed that sandblasting would occur for 8 hours per day and a cumulative total 5 days per year (i.e., a total of 40 hours per year). An uncontrolled PM_{10} emission factor of 0.0014 lb/lb usage was assumed based on the TCEQ's Abrasive Blast Cleaning technical guidance document (RG-169, March 2001). This factor assumes silica sand is used as the blasting media and the factor is higher (more conservative) than the PM_{10} factor of 0.00034 lb/lb usage assuming coal slag is used as the blasting media. Finally, based on this TCEQ guidance, the $PM_{2.5}$ emissions factor is assumed to be equal to 15% of the PM_{10} emissions factor.

Potential VOC and PM emissions were estimated from miscellaneous painting activities. VOC emissions were estimated for the manual application of paint for touch-ups and the use of aerosol cans containing spray paints, primers, degreasers, cleaners and other solvents, and rust inhibitors. VOC and PM emissions were estimated for the spray painting of fixed structures (e.g. tanks). Conservatively, 100% of the VOC content (lb VOC/gal) of all painting materials was assumed to evaporate to the atmosphere. PM emissions from spray painting were estimated using assumed $PM_{10/2.5}$ content, transfer efficiency, and droplet factors for overspray. The detailed painting calculations are shown in Appendix B of this PSD application.

4.0 PSD APPLICABILITY ANALYSIS

This section describes the applicability of the federal Prevention of Significant Deterioration (PSD) permitting program under 40 CFR 52.21 to the proposed Texas GulfLink offshore Deepwater Port Facility. The offshore facility will be located in federal waters on the Outer Continental Shelf (OCS), at a distance greater than 9 nautical miles, but less than 200 nautical miles, from the Texas coast. Because the facility will not be located in a designated nonattainment area, the Nonattainment New Source Review (NNSR) permitting program does not apply. Additionally, because the offshore facility will be located outside of Texas' seaward boundary (i.e., greater than 9 nautical miles off the coast), the US EPA is the governing permit authority.

As described in Section 2.0 of this application, the offshore facility will consist of a fixed platform and two SPM buoys that will be used to load crude oil into VLCCs. An OSV will be positioned alongside a VLCC during loading to recover and process VOC vapors emitted during loading.

As shown in Table 3-1 of this application, due to the vapor recovery process, VOC will be emitted at the Deepwater Port Facility less than the major source emissions threshold of 250 tpy, as defined in §52.21(b)(1)(i)(*a*). As show in the table, no other regulated pollutant will be emitted at a rate greater than 250 tpy. Therefore, the PSD permitting program does not apply to the Deepwater Port facility (i.e., the facility is minor with respect to PSD). Note that, although GHG (CO_2e) is a PSD-regulated pollutant, it does not have a defined significance threshold.

Although the Deepwater Facility does not trigger PSD, permitting requirements of the nearest adjacent state (Texas) must still be followed. These requirements include:

1. State-Best Available Control Technology (State-BACT) for applicable pollutants;
2. Off-property impacts analyses, demonstrating compliance with:
    a. State-National Ambient Air Quality Standard (State-NAAQS) – applicable criteria pollutants of NO_2, CO, SO_2, $PM_{10/2.5}$, and Ozone (VOC)
    b. State Property Line Standard Analysis – applicable sulfur compounds of SO_2, H_2S, and H_2SO_4
    c. Health Effects Analysis (MERA) – applicable hazardous air pollutants that have defined Effects Screening Level (ESL) limits

Note that because PSD does not apply, an additional impacts analysis per §52.21(o) and a federal Class I area impacts analysis per §52.21(p) are not required.

The above TCEQ analyses were performed for applicable pollutants as described in the following sections of this application. Note that there is no *de minimis* air quality level (i.e., SIL) provided for ozone, although demonstration of the ozone NAAQS is required. Per §52.21(i)(5)(i) [see Note to Paragraph (c)(50)(i)(f)], for any net emissions increase of 100 tpy or more of VOC or NOx *subject to PSD*, the applicant is required to perform an ambient impact analysis, including the gathering of ambient air quality data. However, because VOC and NOx are not subject to PSD for this project, the referenced ozone impacts analysis is not required.

5.0 STATE-BACT ANALYSIS

Pursuant to 30 TAC §116.111(a)(2)(C) and TCEQ guidance, a Best Available Control Technology (BACT) analysis is required for all new and/or modified sources that takes into account energy, environmental, economic, and other costs. The following sections describe the BACT analysis performed for the emission units associated with the proposed offshore Deepwater Port Facility. Note that, because the proposed project is considered a minor source with respect to the federal PSD program, the analysis presented in this section is BACT for the State of Texas only ("state-BACT"). However, Texas' state-BACT generally aligns with federal BACT. Also note that BACT does not dictate control technologies; rather, it defines pollutant emission limits. An applicant could choose from multiple control options to achieve the limit. Finally, the TCEQ has not defined BACT for greenhouse gas (GHG) emissions; therefore, GHG is not addressed in this section.

5.1 Overview of TCEQ 3-Tiered BACT Review

The TCEQ uses a 3-tiered approach to evaluate the BACT proposal in New Source Review (NSR) air permit applications. The evaluation begins at the first tier and progresses in sequence to the second and third tiers only if necessary. In each tier, state-BACT is evaluated on a case-by-case basis for technical practicability and economic reasonableness. The TCEQ's three tiers of BACT review are described as follows (from TCEQ "Air Pollution Control", APDG 6110v2, January 2011):

Tier I. In the first tier, an applicant's BACT proposal is compared to the emission reduction performance levels accepted as BACT in recent NSR permit reviews for the same process and/or industry, which can be identified by the principal company product or business, Standard Industrial Classification (SIC) Code, and the North American Industry Classification System (NAICS) system code. A Tier I BACT evaluation can be relatively straightforward in that the technical practicability and economic reasonableness of a particular emission reduction option may have already been demonstrated in prior reviews for the same process and/or industry. However, the BACT evaluation should also take into consideration any new technical developments, which may indicate that additional emission reductions are economically or technically reasonable. The TCEQ has established Tier I BACT requirements for a number of industry types. However, these BACT requirements are subject to change through TCEQ case-by-case evaluation procedures.

Tier II. If BACT requirements have not already been established for a particular process/industry, or if there are compelling technical differences between the applicant facility's process and others in the same industry, the evaluation of the BACT proposal will proceed into the second tier. A Tier II BACT evaluation involves a comparison of the applicant's BACT proposal to the emission reduction performance levels that have been accepted as BACT in recent permit reviews for similar air emission streams in a different process or industry type. This tier of BACT evaluation, therefore, involves the consideration of an emission reduction option(s) already in use in another industry type. As with Tier I evaluations, the economic reasonableness of a particular emission reduction option should already be established by prior permit reviews. However, in-depth technical analysis, such as emission stream comparisons, may be required to determine the technical practicability of an emission reduction option that is normally used in a different process or industry type.

Tier III. A BACT evaluation should proceed to the third tier only if the first two tiers of evaluation have failed to identify an emission reduction option(s) that is technically practicable and economically reasonable. A Tier III BACT evaluation involves a detailed technical and quantitative economic analysis of all emission reduction options available for the process/industry under review. While technical practicability is established through the demonstrated success of an emission reduction option based on previous use and/or an engineering evaluation of a new technology, economic reasonableness is determined by the cost-effectiveness of controlling emissions (expressed as dollars per ton of pollutant reduced) and does not consider the effect of emission reduction costs on corporate economics.

Table 2-1 in Section 2.0 of this application lists the emission sources and pollutants for which a state-BACT analysis was performed. The following section describes those emission sources that meet Tier I BACT.

5.2 TCEQ Tier I BACT Review

A review of TCEQ's Tier I BACT guidance for the Combustion, Chemical, Coating, and Mechanical/Agricultural/Construction Source categories was performed for the proposed Deepwater Port. The most current versions of these tables from TCEQ's website were reviewed. The following paragraphs describe Tier I BACT applicability for each of the emission source types in Table 2-1.

5.2.1 Marine Vessel Loading [EPN (P) M-1]

TCEQ's current Tier I BACT guidance for marine vessel loading is described in the following table. This BACT was reviewed for the VLCC loading operation. This BACT was only found in the Chemical Source guidance document.

Current Tier I BACT Requirements: Chemical Sources								
Unit Type	**Date of Last Update**	**MSS**	**PM**	**VOC**	**NOx**	**SO2**	**CO**	**Other**
Loading: marine vessel	2017	Same as normal operation BACT requirements.		VOC >= 0.5 psia: Route to VOC control device and meet the specific control device requirements. Vessel leak testing: the marine vessel must pass an annual vapor tightness test as specified in 40 CFR §63.565(c) or 40 CFR §61.304(f). During loading of inerted marine vessels, the owner or operator of the marine terminal or of the marine vessel shall conduct AVO checks for leaks once every 8 hours for on-shore equipment and on board the vessel. The pressure at the vapor collection connection and the loading rate must be monitored and recorded. See Marine Terminal Guidance dated September 21, 2016 for emission factors for ship-side emissions. Federal Coast Guard Regulation require ocean-going vessels to be inerted. Therefore, ocean-going vessels cannot use vacuum loading.				

As shown, VOC is the only pollutant with BACT requirements. The VOC vapors resulting from VLCC loading will be recovered and routed to the vapor processing vessel onboard the OSV stationed alongside the VLCC. Although a control efficiency is not specified, VOC will be controlled up to 98% using the proposed vapor recovery process.

As described in Section 6.1 of this application, Texas GulfLink believes that 40 CFR 63 Subpart Y does not apply to the proposed Deepwater Port. However, to meet Tier I BACT, the Deepwater Port will ensure that each VLCC to be loaded will pass an annual vapor tightness test, as specified in 40 CFR §63.565(c). Note that, as described in Section 6.1 of this application, 40 CFR 61 does not apply to the proposed Deepwater Port; therefore, 40 CFR §61.304(f) does not apply.

Deepwater Port personnel will conduct audio, visual, and olfactory (AVO) checks for leaks once every 8 hours on board the VLCC while it is being loaded. The pressure at the vapor collection connection and the loading rate will be monitored and recorded. Because US Coast Guard regulations require ocean-going vessels to be inerted, no VLCC will be vacuum loaded.

5.2.2 Emergency Diesel Firewater Pump Engine [EPN (P) FWP-1]

TCEQ's current Tier I BACT guidance for emergency diesel-fired (compression ignition) engines is described in the following table. This BACT was reviewed for the emergency firewater pump engine on the platform. This BACT was reviewed in the Combustion, Chemical, and Mechanical/Agricultural/Construction Source guidance documents, and the BACT requirements are identical.

Current Tier I BACT Requirements: Combustion Sources														
Version APDG6498v2														
Last Revision Date: June 4, 2019														
Unit Type	Date of Last Update	MSS	PM	VOC	Exempt Solvent	NOx	SO2	CO	NH3	H2S	H2SO4	Hg	HCl
Engine: emergency, diesel	10/1/2018	Minimize duration and occurrence of MSS activities.	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter. No visible emissions shall leave the property. Visible emissions shall be determined by a standard of no visible emissions exceeding 30 seconds in duration in any six-minute period as determined using EPA TM 22 or equivalent	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.		Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.					

The platform emergency firewater pump engine will be EPA-certified to comply with 40 CFR 60 Subpart IIII emission requirements. Additionally, the Deepwater Port commits to using only ultra-low sulfur diesel (≤ 15 ppm_w sulfur content). The Deepwater Port will commit to meeting the visible emissions requirement for particulate matter (PM). Finally, the emergency firewater pump engine will have a non-resettable runtime meter installed on it and will not operate more than 100 hours per year in non-emergency mode. Based on these commitments, the diesel-fired firewater pump engine meets Tier I BACT requirements. Note that emissions from EPN (P) FWP-1 included in this permit application are those from reliability maintenance testing only.

5.2.3 Fugitives From Pipeline Component Leaks [EPNs (OSV) F-1, (P) F-1, (P) F-2]

TCEQ's current Tier I BACT guidance for fugitive emissions from piping component leaks is described in the following table. This BACT was reviewed for the proposed fugitive emissions from the OSV, platform, and SPM piping in VOC service. This BACT was reviewed in the Combustion, Chemical, and Mechanical/Agricultural/Construction Source guidance documents, and the BACT requirements for VOC are identical.

Current Tier I BACT Requirements: Chemical Sources								
Unit Type	**Date of Last Update**	**MSS**	**PM**	**VOC**	**NOx**	**SO2**	**CO**	**Other**
Fugitives: piping and equipment leak	2011	Same as normal operation BACT requirements.		Specify which is applicable: 1. Uncontrolled VOC emissions < 10 tpy: none 2. 10 tpy < uncontrolled VOC emissions < 25 tpy: 28M leak detection and repair program. 75% credit for 28M. 3. Uncontrolled VOC emissions > 25 tpy: 28VHP leak detection and repair program. 97% credit for valves, 85% for pumps and compressors. 4. VOC vp < 0.002 psia: no inspection required, no fugitive emissions expected. 5. For emissions of approved odorous compounds (chlorine, ammonia, hydrogen sulfide, hydrogen cyanide and mercaptans only): AVO inspection twice per shift. Appropriate credit for AVO program.				NH3: AVO inspection twice per shift. Appropriate credit for AVO program. H2S: AVO inspection twice per shift. Appropriate credit for AVO program. HCl: AVO inspection twice per shift. Appropriate credit for AVO program.

From Table 3-1 above and the detailed emission rate calculations in Appendix B, the sum total uncontrolled VOC emission rate from the 3 fugitive emission sources is 0.67 tpy. This total emission rate is significantly less than 10 tpy. Therefore, BACT is "no control" for the fugitive sources.

Emissions of ammonia (NH_3) and hydrogen chloride (HCl) are not expected at the Deepwater Port (at any emission source). Additionally, emissions of hydrogen sulfide (H_2S) are expected to be negligible, as shown in Table 3-2 above and in the detailed emission calculations in Appendix B. Therefore, AVO inspections for these compounds will not be necessary.

5.2.4 Storage Tank < 25K Gal or TVP < 0.5 psia [EPNs (P) DT-1, (P) BT-1, (P) BT-2, (P) BT-3, (P) BT-4]

TCEQ's current Tier I BACT guidance for fixed roof storage tanks with a storage capacity less than 25,000 gallons or storing a material with a true vapor pressure (TVP) less than 0.5 psia is described in the following table. This BACT was found only in the Chemical Source guidance document.

Current Tier I BACT Requirements: Chemical Sources								
Unit Type	**Date of Last Update**	**MSS**	**PM**	**VOC**	**NOx**	**SO2**	**CO**	**Other**
Storage Tank (1): Fixed roof with capacity < 25 Mgal or TVP < 0.50 psia	2015	Same as normal operation BACT requirements except as listed below. <u>Fixed roof tank draining</u>: VOC: Send liquid to a covered vessel. If there is any standing liquid within the tank, and the tank is opened to the atmosphere or ventilated, the vapor stream must be controlled until there is no standing liquid or the VOC vapor pressure is less than 0.02 psia. Control device must meet BACT. Acid: Drain to covered vessel. If there is any standing liquid within the tank, and the tank is opened to the atmosphere or ventilated, the vapor stream must be controlled until there is no standing liquid or the acid vapor pressure is less than 0.02 psia. Control device must meet BACT.		Fixed roof with submerged fill. Uninsulated exterior surfaces exposed to the sun shall be white or aluminum.				Exempt solvent: Fixed roof with submerged fill. Uninsulated exterior surfaces exposed to the sun shall be white or aluminum.

This BACT was reviewed for the proposed diesel day tank and 4 "belly" tanks on the platform. Note that the 4 belly tanks, one each for the 4 diesel-fired engines (2 electric generators, one crane, and one firewater pump), are integrated into the engine housing; therefore, they are not considered stand-alone storage tanks. Nevertheless, applicability to this BACT was reviewed for them.

As shown in the detailed emission calculations in Appendix B, each of these tanks will be less than 25,000 gallons in capacity. All 5 tanks will be fixed roof and atmospheric. These tanks will be designed to be submerged fill. Uninsulated exterior surfaces exposed to the sun will be either aluminum or painted white. None of these tanks are expected to be drained once filled. However, if any are drained or if there is a spill, the liquid diesel would be routed to the covered surge tank on the platform, then pumped out (the surge tank will normally be empty).

5.2.5 Storage Tank > 25K Gal and 0.5 psia < TVP < 11.0 psia

There will be 2 L-VOC storage tanks on the OSV, each with a maximum storage capacity of 1,940 barrels (bbl) (81,480 gal). However, these tanks will be pressurized; they will have no emissions to the atmosphere (they will not be "emission units"). Therefore, these tanks are not subject to BACT review.

The surge "tank" on the platform will have a maximum capacity of 2,000 bbl (84,000 gal). However, it is not considered a storage tank. A surge/relief tank is different from a traditional storage tank since it does not typically hold liquids during normal operations. Such a tank will receive liquids only during a sudden surge event for which the tank will serve as "relief" and quickly receive the excess liquids for a brief period prior to being returned back to the pipeline. The surge tank will not normally store any material. However, the tank will normally be covered to minimize any VOC emissions when material is temporarily contained in it.

5.2.6 MSS for Piping with TVP > 0.5 psia [EPN (P) P-1]

TCEQ's current Tier I BACT guidance for Maintenance, Startup, and Shutdown (MSS) emissions from piping is described in the following table. This BACT was reviewed for the pipeline pigging operation on the platform. This BACT was found in the Chemical Source guidance document and in the Mechanical/Agricultural/Construction Source guidance document (under fugitive emissions from piping and equipment leaks), both documents present identical BACT requirements.

Current Tier I BACT Requirements: Chemical Sources								
Unit Type	**Date of Last Update**	**MSS**	**PM**	**VOC**	**NOx**	**SO2**	**CO**	**Other**
MSS: pipe, VOC > 0.5 psia	2006			Send material to the flare knockout drum to separate into vapors, light liquids, and heavy liquids. Route the vapors back through the process to be recovered before going to the flare using the recovery compressors, where available. Route vapors to flare. Route liquids to slop drums or strippers. Drain any remaining liquid to a pan, then pump to a vacuum truck or put in a closed container. **Alternative 1**: Drain material to a recovery tank that is vented to the flare. Drain any remaining liquid to a pan, then pump the material to a vacuum truck or put in a closed container. **Alternative 2**: Send the material to the refinery slop drums to be recovered. Drain any remaining liquid to a pan, then pump the material to a vacuum truck or put in a closed container.				Exempt solvent: Send material to the flare knockout drum to separate into vapors, light liquids, and heavy liquids. Route the vapors back through the process to be recovered before going to the flare using the recovery compressors, where available. Route vapors to flare. Route liquids to slop drums or strippers. Drain any remaining liquid to a pan, then pump to a vacuum truck or put in a closed container. **Alternative 1**: Drain material to a recovery tank that is vented to the flare. Drain any remaining liquid to a pan, then pump the material to a vacuum truck or put in a closed container. **Alternative 2**: Send the material to the refinery slop drums to be recovered. Drain any remaining liquid to a pan, then pump the material to a vacuum truck or put in a closed container.

The proposed offshore platform will not have a flare. Therefore, any liquid material (crude oil) resulting from pipeline pigging will be captured by a pan underneath the pig receiver then sent to the covered surge tank on the platform. The surge tank will be periodically pumped out. This process meets Alternative 2 listed in the above table for VOC BACT.

5.2.7 MSS for Pumps/Valves with TVP > 0.5 psia [EPN (P) PM-1]

TCEQ's current Tier I BACT guidance for MSS emissions from pump and valve maintenance is described in the following table. Note that TCEQ has a separate guidance document for pumps and valves, but the BACT requirements are identical (so only the table for pumps is shown). This BACT was reviewed for VOC emissions from crude oil pump and valve maintenance activities on the platform. This BACT was found in the Chemical Source guidance document and in the Mechanical/Agricultural/Construction Source guidance document (under fugitive emissions from piping and equipment leaks), both source category documents present identical BACT requirements.

Current Tier I BACT Requirements: Chemical Sources								
Unit Type	Date of Last Update	MSS	PM	VOC	NOx	SO2	CO	Other
MSS: Pump, VOC > 0.5 psia	2006			Send material to the flare knockout drum to separate into vapors, light liquids, and heavy liquids. Vapors are routed to flare. Liquids go to slop drums or strippers. Drain any remaining liquid it to a pan then pump to a vacuum truck or put in a closed container. **Alternative 1**: Send the material to the refinery slop drums to be recovered. If there is any remaining liquid in the system, drain it to a pan then pump to a vacuum truck or put in a closed container. **Alternative 2**: Drain to a recovery tank that is vented to the flare. Drain any remaining liquid to a pan then pump to a vacuum truck or put in a closed container. **Alternative 3**: Steam material to the enclosed sewer. Collect hydrocarbons in the unit sump, to be pumped to the slop tanks and recycled. If any liquids remain, steam or drain to a pan, then pump to vacuum truck or put in closed container.				Exempt solvent: Send material to the flare knockout drum to separate into vapors, light liquids, and heavy liquids. Vapors are routed to flare. Liquids go to slop drums or strippers. Drain any remaining liquid it to a pan then pump to a vacuum truck or put in a closed container. **Alternative 1**: Send the material to the refinery slop drums to be recovered. If there is any remaining liquid in the system, drain it to a pan then pump to a vacuum truck or put in a closed container. **Alternative 2**: Drain to a recovery tank that is vented to the flare. Drain any remaining liquid to a pan then pump to a vacuum truck or put in a closed container. **Alternative 3**: Steam material to the enclosed sewer. Collect hydrocarbons in the unit sump, to be pumped to the slop tanks and recycled. If any liquids remain, steam or drain to a pan, then pump to vacuum truck or put in closed container.

The proposed offshore platform will not have a flare. Therefore, any liquid material (crude oil) resulting from pump and valve maintenance activities will be captured by a pan underneath the pump or valve then sent to the covered surge tank on the platform. The surge tank will be periodically pumped out. This process meets Alternative 1 listed in the above table for VOC BACT.

5.2.8 MSS for Abrasive Blasting/Painting [EPN (P) MSS-1]

TCEQ's current Tier I BACT guidance for abrasive blasting and painting activities are described in the following tables. This BACT was reviewed for emissions from scheduled abrasive blasting and painting activities for the offshore platform. This BACT was found in the Coatings Source guidance document only.

Current Tier I BACT Requirements: Coatings Sources									
Unit Type	Date of Last Update	MSS	PM	VOC	Exempt Solvent	NOx	SO2	CO	H2S
Abrasive Blasting (Non-Enclosed)	10/1/2018	Collection and removal of spent or waste abrasive blast media in such a manner to minimize emissions and placing the waste in covered containers prior to removal from the site.	Use of low dusting abrasives (coal slag, copper slag, nickel slag, steel grit, steel shot, or other media with a free silica content of less than 1.0%). Specify material proposed. Use of shrouds is highly recommended to meet state/federal PM standards and effects review. Shroud material shade factor shall be 85% or greater. Good housekeeping for spills. There shall be no visible emissions crossing the property line. Installation of an enclosure equipped with a ventilation and PM control system may be required if the operation can reasonable be conducted within a structure with a volume of 100,000 cubic feet or less. Provide details about operation size.						

Current Tier I BACT Requirements: Coatings Sources									
Unit Type	Date of Last Update	MSS	PM	VOC	Exempt Solvent	NOx	SO2	CO	H2S
Painting/Surface Coating (Non-Enclosed / Outdoor)	10/1/2018	Startup and shutdown emissions are already included in the emission estimates for both hourly and annual emissions for the coating operations and abrasive blasting operations. The short term emission rates are no higher than normal operations and the emission control techniques for normal operations are considered acceptable for startup and shutdown. Emissions from filter replacement are limited through the use of work practices that limit the emissions of captured particulate matter.	Use of high transfer efficiency application equipment: airless, air-assisted airless, or electrostatic high-volume low-pressure spray equipment or brushes, rollers, dipping, and/or flow coating. Please specify which application type(s). Good housekeeping and best management practices. See applicable 30 TAC §115 and/or 40 CFR Part 63 requirements. Installation of an enclosure equipped with a ventilation and PM control system may be required if the operation can reasonably be conducted within a structure of 100,000 cubic feet or less. There shall be no visible emissions crossing the property line. Although no emission credit will be given, use of shrouds is highly recommended to meet state/federal PM standards and health effects review. Shroud material shade factor should be 85% or greater.	Use of 30 TAC §115.453 or 115.421 (as applicable) compliant coatings. Alternate controls as specified in 30 TAC §115,454 or 115.423 may be used to meet the applicable VOC content limits. Use of high transfer efficiency application equipment: airless, air-assisted airless, or electrostatic high-volume low-pressure spray equipment or brushes, rollers, dipping, and/or flow coating. Please specify which application type(s). Good housekeeping and best management practices. See applicable 30 TAC §115 and/or 40 CFR Part 63 requirements. Installation of an enclosure equipped with a ventilation and PM control system may be required if the operation can reasonably be conducted within a structure of 100,000 cubic feet or less.	Use of 30 TAC §115.453 or 115.421 (as applicable) compliant coatings. Alternate controls as specified in 30 TAC §115,454 or 115.423 may be used to meet the applicable VOC content limits. Use of high transfer efficiency application equipment: airless, air-assisted airless, or electrostatic high-volume low-pressure spray equipment or brushes, rollers, dipping, and/or flow coating. Please specify which application type(s). Good housekeeping and best management practices. See applicable 30 TAC §115 and/or 40 CFR Part 63 requirements. Installation of an enclosure equipped with a ventilation and PM control system may be required if the operation can reasonably be conducted within a structure of 100,000 cubic feet or less.				

As described in Section 3.4.12, the coatings on the offshore platform will have a designed life of over 20 years. Sandblasting and recoating of the platform structure should not be required within this period, other than spot maintenance where coatings may be damaged by contact with metal objects such as hammers, wrenches, or scaffolding.

For VOC and PM emissions, the proposed Deepwater Port facility (including the offshore platform) is not subject to the surface coating requirements in either 30 TAC §115.421 or §115.453, because it will not be located in the Houston-Galveston-Brazoria (HGB) or Dallas-Fort Worth (DFW) ozone nonattainment areas (or the Beaumont-Port Arthur (BPA) former ozone nonattainment area), nor in Gregg, Nueces, or Victoria Counties (reference the applicability criteria found in 30 TAC §115.420(a) and §115.450(a)). Nevertheless, when occasional spot coating is performed, personnel will use high transfer efficiency equipment, such as airless, air-assisted airless, or electrostatic high-volume, low-pressure spray equipment, or use brushes, rollers, dipping, and/or flow coating methods. Good housekeeping will be maintained throughout the spot coating process. Spent abrasive blast media will be collected and placed in covered containers before disposal. When practical, a shroud around the coating location will be used to minimize the transport of emissions off-property.

5.2.9 General MSS [EPN (OSV) MSS-2]

TCEQ’s current Tier I BACT guidance for general MSS activities is described in the following table. This BACT was reviewed for the miscellaneous MSS activities on the OSV (specific MSS activities associated with the offshore platform are described in the paragraphs above). This BACT was reviewed in the Combustion Source guidance document. The general MSS BACT guidance in the Mechanical/Agricultural/Construction Source guidance document states “No established BACT”.

Current Tier I BACT Requirements: Combustion Sources													
Version APDG6498v2													
Last Revision Date: June 4, 2019													
Unit Type	Date of Last Update	MSS	PM	VOC	Exempt Solvent	NOx	SO2	CO	NH3	H2S	H2SO4	Hg	HCl
MSS activities	10/1/2018	Use of good air pollution control practices and safe operating practices. Limiting the frequency and duration of activities.											

As described in Section 3.3.6, miscellaneous maintenance activities on the OSV will include oil/filter changes, clearing vapor processing module lines, etc. Oil/filter and other maintenance activity events are expected to occur approximately every 60 days. Module line clearing is expected to occur after each VLCC load (approximately 180 loads per year). When performing these MSS activities, OSV personnel will use good air pollution control practices and safe operating practices (e.g. expedite completion of the activity to minimize emissions).

5.2.10 Diesel Generators (Non-Emergency) [EPNs (P) G-1, (P) G-2, (OSV) EDG-1, (OSV) EDG-3]

A review of TCEQ's Tier I BACT guidance documents (Combustion, Chemical, Coating, and Mechanical/Agricultural/Construction) was performed, and no Tier I BACT was identified for *non-emergency* diesel-fired electric generators. Because Tier I BACT is not defined for this emission source type, a Tier II analysis was performed (see Section 5.3).

5.2.11 Gas Turbine Generators (Non-Emergency) [EPNs (OSV) GT-1, (OSV) GT-2]

TCEQ's current Tier I BACT guidance for combined-cycle gas turbine generators is described in the following table. This BACT was reviewed for the 2 GT generators on the OSV. This BACT was identified in the Combustion and Chemical Source category guidance documents, and the BACT requirements are identical.

Current Tier I BACT Requirements: Combustion Sources													
Version APDG6498v2													
Last Revision Date: June 4, 2019													
Unit Type	Date of Last Update	MSS	PM	VOC	Exempt Solvent	NOx	SO2	CO	NH3	H2S	H2SO4	Hg	HCl
Turbine: combined cycle, natural gas	10/1/2018	Minimizing the duration of MSS activities and minimizing the amount of time the turbine is outside the performance mode where the controls can be used. Operating the facility in accordance with best management practices and good air pollution control practices.	Good combustion practices. Fuel limited to firing pipeline quality natural gas.	2 ppmvd at 15% O2 if no duct burner, 4 ppmvd with duct burner. Achieved through good combustion practices.		2.0 ppmvd at 15% O2, 24-hour average, typically achieved with dry low NOX burner, water/steam injection, limiting fuel consumption, or SCR. Specify numeric value and proposed technique.	Good combustion practices. Fuel limited to firing pipeline quality natural gas (low sulfur fuel). Sulfur content of fuel will not exceed 5 grains per 100 scf on an hourly basis and 1 gr/100 scf on an annual basis.	2-4 ppmvd at 15% O2, typically achieved with good combustion practices and/or oxidation catalyst. Specify numeric value and control technique. A detailed analysis is required if >4 ppmvd is proposed.	7-10 ppmvd at 15% O, achieved by controlling the ammonia injection system to minimize ammonia slip		Good combustion practices. Fuel limited to firing pipeline quality natural gas (low sulfur fuel). Sulfur content of fuel will not exceed 5 grains per 100 scf on an hourly basis and 1 gr/100 scf on an annual basis.		

The proposed GT generators on the OSV will be OPRA 16C turbines that will fire a gas fuel mixture of L-VOC and S-VOC from the vapor processing module. As shown in the detailed emission rate calculations in Appendix B, the maximum exhaust concentrations of NOx, CO, and VOC will be 40

ppm_v, 50 ppm_v, and 5 ppm_v, respectively, on a 15% oxygen correction basis. Although the TCEQ has established Tier I BACT limits for combined-cycle gas turbines, the proposed GTs on the OSV are sufficiently different in design and fuel combusted that the TCEQ BACT limits do not apply. However, a Tier II BACT analysis for the GTs was performed to establish state-BACT (see Section 5.3).

5.2.12 Summary of Tier I BACT

The following table provides a summary of the Tier I BACT for applicable project emission sources.

Table 5-1: Summary of Tier I BACT

Emissions Unit Category	Pollutant	Tier I BACT
Platform (EPN)		
Marine Vessel Loading [(P) M-1]	VOC	• Route VOC to control device and meet the specific control device requirements • Annual vapor tightness test for marine vessel • AVO checks for leaks on marine vessel every 8 hours during loading • Loading rate and pressure at vapor collection connection monitored and recorded
Emergency Diesel FW Pump Engine [(P) FWP-1]	VOC, NOx, CO, SO_2	• Meeting applicable requirements of 40 CFR 60 Subpart IIII • ULSD (< 15 ppm_W sulfur content) • ≤ 100 hours non-emergency operation • Non-resettable runtime meter
	$PM_{10/2.5}$	• Same requirements as for VOC, NO, CO, and SO_2 • No visible emissions > 30 sec in any 6-min period
Pipeline Fugitives [(P) F-1, (P) F-2]	VOC	• No control (site-wide total Fugitive emissions < 10 tpy)
Storage Tank < 25K gal or TVP < 0.5 psia [(P) DT-1, BT-1, BT-2, BT-3, BT-4]	VOC	• Fixed roof with submerged fill • Uninsulated exterior surface exposed to the sun either aluminum or white
Storage Tank > 25K gal and 0.5 < TVP < 11.0 psia	--	• N/A
MSS for Piping with TVP > 0.5 psia [(P) P-1]	VOC	• Send material to slop. Drain remaining to pan, then pump to closed container (Alternative 2)
MSS for Pumps/Valves with TVP > 0.5 psia [(P) PM-1]	VOC	• Send material to slop. Drain remaining to pan, then pump to closed container (Alternative 1)
MSS for Abrasive Blasting/Painting [(P) MSS-1]	VOC, PM	• Use of high transfer efficiency equipment (for spot coating) • Use of a shroud when practical (for coating) • Good housekeeping and best management practices • Collect spent abrasive blast media and place in covered containers prior to disposal • No visible emissions crossing property line

Emissions Unit Category	Pollutant	Tier I BACT
OSV (EPN)		
Pipeline Fugitives [(OSV) F-1]	VOC	• No control (site-wide total Fugitive emissions < 10 tpy)
General MSS [(OSV) MSS-2]		• Use of good air pollution control and safe operating practices • Limiting duration and frequency of activities

5.3 Tier II BACT Review

This section describes state-BACT for those Deepwater Port facility emission sources that either do not meet TCEQ's Tier I BACT or for which the Tier I BACT does not apply. As described in Section 5.1, a TCEQ Tier II BACT evaluation involves a comparison of the applicant's BACT proposal to the emission reduction performance levels that have been accepted as BACT in recent permit reviews for similar air emission streams in a different process or industry type. This tier of BACT evaluation involves the consideration of emission reduction option(s) already in use in another industry type.

5.3.1 Diesel Generators (non-emergency)

Diesel electric generators are used in a wide variety of industries including mining, oil and gas, utilities, commercial, construction, manufacturing, healthcare, and the military. The 2 non-emergency diesel electric generators proposed for the offshore platform are 650 kW generators, where only one will operate at a time. The diesel generators selected for the platform will be of size and type typically operated on offshore platforms.

The 4 non-emergency diesel electric generators on the OSV include 2 Caterpillar 3516C generators at approximately 2,000 kW each and 2 Caterpillar 3512C generators at approximately 1,700 kW each. For permitting purposes, only 2 of the 4 diesel generators will operate at a time. The 2 that operate will be back-up generators to the 2 GT generators associated with the vapor processing module operated during VLCC loading (including hose disconnects). The 4 diesel generators will be of a size and type typically operated on OSVs.

A review of EPA's RBLC database, other air permits, and technical documents was performed to identify emission reduction options for diesel electric generator engines. The following paragraphs present these reduction options for each regulated pollutant from the proposed Deepwater Port facility diesel generators (platform and OSV), and describe the technical feasibility of each option (for Tier II, economic reasonableness is assumed).

<u>VOC</u>
Potential technically feasible options for controlling VOC emissions from the 4 operating diesel generator engines include:

- Post-combustion EMx catalyst system
- Post-combustion oxidation catalyst
- Compliance with requirements of 40 CFR 60 Subpart IIII
- Good combustion practices

EMx Catalyst System – According to brochures, EMx™ is a single catalytic system that can reduce emissions of NOx, SO_2, CO, VOC, and PM to levels approaching zero throughout all operating cycles of a power generation application. It is the most effective Ammonia Free Reduction (AFR) technology available for gas turbine, internal combustion engine, and industrial utility boiler applications. In reality, however, the EMx catalyst system has only been used in very limited applications on gas turbines at electric utility plants. There is no listing in EPA's RBLC database of the EMx catalyst system being used on internal combustion engines, including for diesel electric generators. In addition, the catalyst is very susceptible to poisoning by even the low amount of sulfur in diesel fuel. Because of the lack of commercial use on internal combustion engines, the EMx catalyst system is considered technically infeasible as a VOC control for the OSV diesel generators.

Oxidation Catalyst – The addition of a catalyst bed to the exhaust outlet of an engine causes significant pressure drop and back pressure to the engine. This reduces the power/energy efficiency of the engine. An oxidation catalyst would cause reactions with VOC in the generator exhaust further converting it to CO_2, which is released to the atmosphere as additional collateral emissions. The waste generated by spent catalyst must be replaced approximately every 5 years and disposed of potentially as a hazardous waste. Finally, as shown in Table 3-1 above, the total estimated VOC emissions from the 2 platform diesel generators [EPNs (P) G-1 and (P) G-2] is 1.16 tpy, and the total estimated VOC emissions from the 2 operating OSV diesel generators [EPNs (OSV) EDG-1 and (OSV) EDG-3] is 1.39 tpy. Based on such low VOC emissions, installation of an oxidation catalyst on the diesel generators is considered impractical.

Therefore, Texas GulfLink proposes as BACT for control of VOC from the 4 diesel generator engines a combination of good combustion practices following engine manufacturer specifications and compliance with applicable requirements of 40 CFR 60 Subpart IIII.

NOx

Potential technically feasible options for controlling NOx emissions from diesel generator engines include:

- Fuel selection
- Lean burn combustion
- Post-combustion Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), or Non-Selective Catalytic Reduction (NSCR)
- Compliance with requirements of 40 CFR 60 Subpart IIII
- Good combustion practices

Fuel Selection – Typically, natural gas-fired engines can provide for lower NOx emissions performance as compared to diesel-fired engines. However, no fuel gas pipeline, such as a natural gas or propane pipeline, would be readily present in the remote offshore location of the proposed Deepwater Port facility. Therefore, natural gas-fired engines would require significant storage of the fuel on the platform and OSV, creating reliability issues. The offshore location, weather conditions, and sea conditions would present many challenges that render natural gas fuel supply via pipeline and/or storage infeasible due to safety and energy concerns. Diesel fuel can be more reliably and efficiently transported (from an energy and emissions perspective) to the offshore location. For these reasons, fuel selection is a technically infeasible control option. Diesel fuel is proposed for the engines.

Lean Burn Combustion – Lean-burn combustion refers to the burning of fuel with an excess of air in an internal combustion engine. Lean burn combustion limits the fuel so that the air-fuel ratio is below stoichiometric conditions. By limiting the fuel, peak combustion temperatures are lowered so that thermal NOx formation is reduced. Lean burn combustion is a technically feasible NOx control option for the 4 diesel generators.

Post-Combustion SCR, SNCR, or NSCR – For the diesel generators, SCR technology would create collateral emissions of ammonia due to requiring injection of ammonia (or urea) into the exhaust stream upstream of the catalyst. Some of the ammonia passes through unreacted, which is known as “ammonia slip”. The storage of ammonia on the offshore platform and OSV, and the ammonia slip from the SCR unit, would create safety concerns for the personnel in close proximity (i.e., those living on the platform and operating the OSV) since ammonia is toxic and can cause irritation and burning of the skin, eyes, nose, and throat. Another adverse environmental impact is the waste generated by spent catalyst from the SCR unit which must be replaced, for typical operations, approximately every three years and disposed of as a hazardous waste. Based on these safety, health, and environmental concerns, SCR is rejected as a feasible control option for NOx emissions from all 4 diesel generators because these disadvantages outweigh any NOx emission reduction benefit.

SNCR technology is normally effective for treating flue gases in the temperature range of approximately 1,600°F to 1,900°F. Diesel engines typically have maximum exhaust manifold temperatures in the range of 700 °F – 1,100°F, well below the usual effective operating range of an SNCR. For this reason, SNCR is eliminated from consideration as a technically feasible control option for the 4 diesel generators.

To be effective, NSCR technology requires a fuel-rich vapor stream with very low oxygen content. Diesel engines inherently operate “lean” with higher oxygen, and lean levels of fuel in the exhaust. Therefore, NSCR is not effective for NOx reduction in diesel engine exhaust and is, therefore, eliminated from consideration as a technically feasible NOx control option.

Therefore, Texas GulfLink proposes as BACT for NOx emissions from the diesel generator engines a combination of good combustion practices following engine manufacturer specifications, lean burn combustion, and compliance with applicable requirements of 40 CFR 60 Subpart IIII.

CO

Potential technically feasible options for controlling CO emissions from diesel generator engines include:

- Post-combustion EMx catalyst system
- Post-combustion oxidation catalyst
- Compliance with requirements of 40 CFR 60 Subpart IIII
- Good combustion practices

EMx Catalyst System – The addition of an EMx catalyst system on the diesel generators is considered technically infeasible (see the description under VOC above).

Oxidation Catalyst – The addition of a catalyst bed to the exhaust outlet of an engine causes significant pressure drop and back pressure to the engine. This reduces the power/energy efficiency of the engine. An oxidation catalyst would cause reactions with CO in the generator exhaust further converting it to CO_2, which is released to the atmosphere as additional collateral emissions. The waste generated by spent catalyst must be replaced approximately every 5 years and disposed of potentially as a hazardous waste. For these reasons, an oxidation catalyst is a technically infeasible control option.

Therefore, Texas GulfLink proposes as BACT for control of CO from the 4 diesel generator engines a combination of good combustion practices following engine manufacturer specifications and compliance with applicable requirements of 40 CFR 60 Subpart IIII.

SO_2

In-combustion or post-combustion SO_2 emission control options were not identified in EPA's RBLC database or in recently issued air permits for diesel generator engines. Although the TCEQ has not defined Tier I BACT for *non-emergency* diesel generator engines, for emergency-use engines, BACT is the use of ultra-low sulfur diesel (ULSD), with no more than 15 ppm_w sulfur content. This limit also meets the requirements of 40 CFR 60 Subpart IIII. Therefore, although not applicable to non-emergency diesel generators, Texas GulfLink proposes as BACT use of ULSD with no more than 15 ppm_w sulfur content to control SO_2 emissions from the diesel generators.

$PM_{10/2.5}$

A review of EPA's RBLC database for PM emission controls on applicable diesel generators indicates the use of good combustion practices following engine manufacturer specifications, ULSD with no more than 15 ppm_w sulfur content, and compliance with the applicable requirements of 40 CFR 60 Subpart IIII. Texas GulfLink proposes as BACT these requirements for the 4 diesel generator engines.

5.3.2 GT Generators (non-emergency)

Gas Turbine (GT) electric generators are used in a variety of industries, including the power generation and oil and gas industries. The 2 non-emergency GT generator packages proposed for the OSV are 1,800 kW GT generators. These GTs generators will utilize novel (patent pending) technology to combust L-VOC and S-VOC fuel obtained from the vapor processing module to produce electricity and usable heat. The turbine core will utilize OPRA Turbines' OP16-3C combustors, and the overall GT package will be developed by Airem Energy.

The proposed GT generators are the most efficient combined-cycle GT generators in use anywhere in the world. OPRA's OP16 GT has a long track record in offshore operations. Several units are currently operating on board Floating Production Storage and Offloading (FPSO) vessels in the North Sea and in the South Atlantic Ocean. They produce a tremendous amount of usable heat in addition to the electricity generated, which results in lower overall fuel requirements to cover both heat and power requirements.

The GTs have a radial rotor design that allows for a compact GT package, with only a third of the moving parts of conventional combined-cycle GT generators. This compact design is necessary given the limited space on the OSV. The design will allow for top-deck installation, given the lack of below deck space taken up by the OSV's main engine room.

The proposed GTs will be novel in their combustor and fuel injection system design. The OP16-3C combustor was designed to handle very low calorific (heating value) fuels, ranging from around 3 megajoules per kilogram (MJ/kg) to 20 MJ/kg. The combustor's uniqueness lays in its ability to burn gas fuels with changing composition, and simultaneous operation on several fuels at the same time (i.e., combusting both low-calorific and high-calorific fuels). This design flexibility is a key feature to be able to combust the S-VOC fuel because composition of the S-VOC will change during GT loading, typically starting at low LHV and increasing with increasing GT loading. The GT combustor, fuel system, and control system will be designed to automatically compensate changing composition and LHV of the S-VOC fuel and, if required, top-up with the secondary fuel (L-VOC) to meet power demand. A conventional natural gas-fired combined-cycle GT is not designed to handle such swings in fuel heating value and combusting multiple fuels at once.

A review of EPA's RBLC database, other air permits, and technical documents was performed to identify emission reduction options for the proposed combined-cycle GT generators. Given the uniqueness of its design and the lack of US-based applications, applicable emission reduction options for the specific GTs were not identified. Nevertheless, the following paragraphs describe a review of typical *natural gas-fired* non-emergency combined-cycle GT reduction options, by regulated pollutant, and describe the technical feasibility of each option (for Tier II, economic reasonableness is assumed).

<u>VOC</u>
Potential technically feasible options for controlling VOC emissions from a *natural gas-fired* GT generator, in order of effectiveness, include:

- Natural gas fuel
- Post-combustion oxidation catalyst

- Compliance with requirements of 40 CFR 60 Subpart JJJJ
- Good combustion practices

Natural Gas Fuel – The proposed OPRA OP16 GTs will combust as fuel the L-VOC and S-VOC received from the vapor processing module on the OSV. In considering natural gas fuel, no fuel gas pipeline would be readily present in the remote offshore location of the proposed Deepwater Port facility (45 miles offshore). Therefore, natural gas-fired engines would require significant storage of the fuel on the platform and OSV, creating reliability issues. The offshore location, weather conditions, and sea conditions would present many challenges that render natural gas fuel supply via pipeline and/or storage infeasible due to safety and energy concerns. For these reasons, use of natural gas fuel is technically infeasible.

Oxidation Catalyst – The addition of a catalyst bed to the exhaust outlet of an engine causes significant pressure drop and back pressure to the engine. This reduces the power/energy efficiency of the engine. An oxidation catalyst would cause reactions with VOC in the GT generator exhaust further converting it to CO_2, which is released to the atmosphere as additional collateral emissions. The waste generated by spent catalyst must be replaced approximately every 5 years and disposed of potentially as a hazardous waste. Finally, as shown in Table 3-1 above, the total estimated VOC emissions from the 2 GT generators [EPNs (OSV) GT-1 and (OSV) GT-2] is 1.96 tpy. Based on such a low VOC emission rate, installation of an oxidation catalyst on the GT generators is considered impractical.

Compliance with 40 CFR 60 Subpart JJJJ – The proposed maximum exhaust concentration of VOC (5 ppmv), corrected to 15% oxygen, will be well below the NSPS Subpart JJJJ Table 1 emission limits for VOC of 86 ppm_{vd} for "Non-Emergency SI Natural Gas and Non-Emergency SI Lean Burn LPG (except lean burn 500 ≤ HP < 1,350)" ≥ 500 HP.

Therefore, Texas GulfLink proposes as BACT for control of VOC from the 2 GT generators a combination of good combustion practices following turbine manufacturer specifications and compliance with applicable requirements of 40 CFR 60 Subpart JJJJ.

<u>NOx</u>

Potent technically feasible options for controlling NOx emissions from a *natural gas-fired* GT generator include:

- Fuel selection
- Lean Burn Combustion
- Adherence to IMO Tier III Limit for NOx
- Post-combustion Selective Catalytic Reduction (SCR), Selective Non-Catalytic Reduction (SNCR), or Non-Selective Catalytic Reduction (NSCR)
- Compliance with requirements of 40 CFR 60 Subpart JJJJ
- Good combustion practices

Fuel Selection – The proposed OPRA OP16 GTs will combust as fuel the L-VOC and S-VOC received from the vapor processing module on the OSV. In considering natural gas fuel, no fuel gas pipeline would be readily present in the remote offshore location of the proposed Deepwater Port facility (45 miles offshore). Therefore, natural gas-fired engines would require significant storage of the fuel on the platform and OSV, creating reliability issues. The offshore location, weather conditions, and sea conditions would present many challenges that render natural gas fuel supply via pipeline and/or storage infeasible due to safety and energy concerns. For these reasons, use of natural gas fuel is technically infeasible.

Diesel fuel-fired turbines were considered but rejected because the main purpose of having gas-fired turbines is to combust the waste gas (L-VOC and S-VOC) generated by the vapor processing module. If the L-VOC and S-VOC were not combusted as fuel to the GTs, they would have to be vented to the atmosphere. At 90% load and 20 ^{o}C, the approximate flowrate of L-VOC (60% of total flow) would be 0.09 kg/s (714.3 lb/hr) and the approximate flowrate of S-VOC (40% of total flow) would be 0.14 kg/s (1,111.1 lb/hr). These high VOC emission rates would negatively impact the environmental as well as present safety concerns to personnel working on the OSV. These fuel streams must be combusted/controlled by using gas turbine generators.

Lean Burn Combustion – Lean-burn combustion refers to the burning of fuel with an excess of air in an internal combustion engine. Lean burn combustion limits the fuel so that the air-fuel ratio is below stoichiometric conditions. By limiting the fuel, peak combustion temperatures are lowered so that thermal NOx formation is reduced. Lean burn combustion is a technically feasible NOx control option for the 2 GT generators.

Post-Combustion SCR, SNCR, or NSCR – For the GT generators, SCR technology would create collateral emissions of ammonia due to requiring injection of ammonia (or urea) into the exhaust stream upstream of the catalyst. Some of the ammonia passes through unreacted, which is known as "ammonia slip". The storage of ammonia on the offshore platform and OSV, and the ammonia slip from the SCR unit, would create safety concerns for the personnel in close proximity (i.e., those living on the platform and operating the OSV) since ammonia is toxic and can cause irritation and burning of the skin, eyes, nose, and throat. Another adverse environmental impact is the waste generated by spent catalyst from the SCR unit which must be replaced, for typical operations, approximately every three years and disposed of as a hazardous waste. Based on these safety, health, and environmental concerns, SCR is rejected as a feasible control option for NOx emissions from the 2 GT generators because these disadvantages outweigh any NOx emission reduction benefit.

SNCR technology is normally effective for treating flue gases in the temperature range of approximately 1,600°F to 1,900°F. The GT generators will have a maximum exhaust temperature of approximately 1,064°F, well below the usual effective operating range of an SNCR. For this reason, SNCR is eliminated from consideration as a technically feasible control option for the 2 GT generators.

To be effective, NSCR technology requires a fuel-rich vapor stream with very low oxygen content. The proposed GT generators will operate “lean” with higher oxygen, and lean levels of fuel in the exhaust. Therefore, NSCR is not effective for NOx reduction in the GT generator exhaust and is, therefore, eliminated from consideration as a technically feasible NOx control option.

IMO Tier III Limit for NOx – The proposed OPRA OP16 GTs will have low NOx emissions adhering to International Maritime Organization (IMO) Tier III emission requirements without SCRs. The GT will have a rotational speed of approximately 26,000 rpm. The IMO Tier III NOx limit for > 2,000 rpm is 1.96 g/kW-hr. At a maximum NOx exhaust concentration (at 90% load) of 40 ppm_v, the maximum NOx emission rate is 3.48 lb/hr (see the detailed emission rate calculations in Appendix B). The OP16 GT will have a maximum power rating of 1,800 kW and a maximum exhaust rate of 9.2 kg/hr. At these conditions (and converting lb to kg), the maximum NOx emission rate of 3.48 lb/hr converts to 0.88 g/kW-hr, which is below the IMO Tier III NOx limit of 1.96 g/kW-hr.

Compliance with 40 CFR 60 Subpart JJJJ – The proposed maximum exhaust concentration of NOx (40 ppmv), corrected to 15% oxygen, will be well below the NSPS Subpart JJJJ Table 1 emission limits for NOx of 160 ppm_{vd} for “Non-Emergency SI Natural Gas and Non-Emergency SI Lean Burn LPG (except lean burn 500 ≤ HP < 1,350)” ≥ 500 HP.

Therefore, Texas GulfLink proposes as BACT for NOx emissions from the GT generator engines a combination of adherence to the IMO Tier III limit for NOx, lean burn combustion, compliance with applicable requirements of 40 CFR 60 Subpart JJJJ, and good combustion practices based on engine manufacturer specifications.

<u>CO</u>

Potential technically feasible options for controlling CO emissions from *natural gas-fired* GT generators include:

- Post-combustion EMx catalyst system
- Post-combustion oxidation catalyst
- Compliance with requirements of 40 CFR 60 Subpart JJJJ
- Good combustion practices

EMx Catalyst System – The addition of an EMx catalyst system on the GT generators is considered technically infeasible (see the descriptions under VOC and CO for diesel generators above).

Oxidation Catalyst – The addition of a catalyst bed to the exhaust outlet of an engine causes significant pressure drop and back pressure to the engine. This reduces the power/energy efficiency of the engine. An oxidation catalyst would cause reactions with CO in the generator exhaust further converting it to CO_2, which is released to the atmosphere as additional collateral emissions. The waste generated by spent catalyst must be replaced approximately every 5 years and disposed of potentially as a hazardous waste. Finally, because each GT generator will have a heat recovery unit on its exhaust stack, the addition of an oxidation catalyst bed on the same exhaust stack is considered impractical.

Compliance with 40 CFR 60 Subpart JJJJ – The proposed maximum exhaust concentration of CO (50 ppmv), corrected to 15% oxygen, will be well below the NSPS Subpart JJJJ Table 1 emission limit for CO of 540 ppm_{vd} from "Non-Emergency SI Natural Gas and Non-Emergency SI Lean Burn LPG (except lean burn 500 ≤ HP < 1,350)" ≥ 500 HP.

Therefore, Texas GulfLink proposes as BACT for CO emissions from the GT generator engines a combination of good combustion practices following engine manufacturer specifications and compliance with applicable requirements of 40 CFR 60 Subpart JJJJ.

SO_2

In-combustion or post-combustion SO_2 emission control options were not identified in EPA's RBLC database or in recently issued air permits for non-emergency combined-cycle GT generators. For the proposed GT generators, TGL considers BACT as adhering to good combustion practices following manufacturing specifications and use of a fuel with a sulfur content not to exceed 5 grains per 100 scf on an hourly basis and 1 gr/100 scf on an annual basis. Texas GulfLink proposes as BACT these requirements for the 2 GT generators.

$PM_{10/2.5}$

A review of EPA's RBLC database for PM emission controls on non-emergency GT generators indicates combusting natural gas and the use of good combustion practices following engine manufacturer specifications. As previously described, natural gas fuel is not technically feasible for the proposed GTs. Therefore, Texas GulfLink proposes as BACT use of good combustion practices for the 2 GT generators.

5.3.3 Summary of Tier II BACT

The following table summarizes the results of the Tier II BACT review performed for the

Table 5-2: Summary of Tier II BACT

Emissions Unit Category	Pollutant	Tier II BACT Selection
Platform and OSV		
Diesel Electric Generators	VOC	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII • Good combustion practices following manufacturer's specifications
	NOx	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII • Lean burn combustion • Good combustion practices following manufacturer's specifications
	CO	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII • Good combustion practices following manufacturer's specifications
	SO_2	• Use of ULSD fuel with no more than 15 ppm_w sulfur content
	$PM_{10/2.5}$	• Compliance with applicable requirements of 40 CFR 60 Subpart IIII • Use of ULSD fuel with no more than 15 ppm_w sulfur content • Good combustion practices following manufacturer's specifications

Emissions Unit Category	Pollutant	Tier II BACT Selection
OSV		
GT Electric Generators	VOC	• Compliance with applicable requirements of 40 CFR 60 Subpart JJJJ • Good combustion practices following manufacturer's specifications
	NOx	• Adherence to IMO Tier III limit for NOx • Lean burn combustion • Compliance with applicable requirements of 40 CFR 60 Subpart JJJJ • Good combustion practices following manufacturer's specifications
	CO	• Compliance with applicable requirements of 40 CFR 60 Subpart JJJJ • Good combustion practices following manufacturer's specifications
	SO_2	• Fuel with sulfur content ≤ 5 gr/100 scf (hourly), 1 gr/100 scf (annual) • Good combustion practices
	$PM_{10/2.5}$	• Good combustion practices following manufacturer's specifications

6.0 REGULATORY APPLICABILITY

In this section, potentially applicable federal and state air regulations are reviewed for the proposed Texas GulfLink Deepwater Port Facility. Note that the US Environmental Protection Agency (EPA) does not normally administer the Clean Air Act (CAA) in the western Gulf of Mexico because under CAA Section 328, the Department of lnterior's Bureau of Ocean Energy Management (BOEM) is responsible for regulating outer continental shelf (OCS) sources, as defined by the OCS Lands Act, in that area. However, because the proposed Deepwater Port Facility will not be a defined OCS source, Section 328 does not apply. Instead, the EPA is the CAA permitting authority for non-OCS sources in federal waters.

The EPA regards a provision of the Deepwater Port Act (DPA), 33 U.S.C. §1501, *et seq,* as the primary source of its authority to apply the CAA to activities associated with deepwater ports. The DPA applies federal law, and applicable State law, to deepwater ports and further designates deepwater ports as "new sources" for CAA purposes. Accordingly, for the source's pre-construction and operating permits, EPA will rely on the provisions of Title I and Title V, respectively, of the CAA supporting applicable regulations, and on the State's law to the extent applicable and consistent with federal law.

Section 6.1 below describes the potentially applicable federal air regulations in Title 40 of the Code of Federal Regulations (40 CFR). Section 6.2 below describes the potentially applicable Texas air regulations in Title 30 of the Texas Administrative Code (30 TAC), as administered by the Texas Commission on Environmental Quality (TCEQ).

6.1 Federal Air Regulations – 40 CFR

The federal air regulations reviewed include New Source Performance Standards (NSPS) in 40 CFR Part 60, National Emission Standards for Hazardous Air Pollutants (NESHAP) in 40 CFR Part 61, and NESHAP for Source Categories (which outlines Maximum Achievable Control Technology, "MACT") in 40 CFR Part 63. Note that the applicability of 40 CFR Parts 70/71 (federal Title V) is included under separate cover.

NSPS – 40 CFR Part 60

<u>Subpart A: General Provisions</u>
Any emission source subject to a specific NSPS is also subject to applicable general provisions in this subpart. Unless specifically excluded by the source-specific NSPS, Subpart A generally requires initial construction notification, initial startup notification, performance tests/notifications, general monitoring requirements, general recordkeeping requirements, and semi-annual monitoring and/or excess emission reports. Because the proposed Texas GulfLink Deepwater Port Facility will be subject to one or more source-specific NSPS, the facility will comply with the applicable general provisions under Subpart A.

Subparts D, Da, Db, Dc: Steam Generating Units

The proposed Deepwater Port Facility (OSV or platform) will not operate a defined steam generating unit (SGU). Therefore, these rules that apply to SGUs do not apply.

Subparts Kb: Petroleum Liquid Storage Vessels Constructed, Reconstructed, or Modified after July 23, 1984

This subpart applies to a storage vessel with a capacity greater than or equal to 20,000 gallons that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification commenced after July 23, 1984. However, the subpart does not apply to a storage vessel with a capacity greater than or equal to 40,000 gallons storing a liquid with a maximum true vapor pressure (TVP) less than 0.5 psia, or with a capacity between 20,000 and 40,000 gallons storing a liquid with a maximum TVP less than 2.2 psia.

OSV

The two L-VOC pressure storage tanks (part of the vapor processing module) will each have a storage capacity of 1,940 bbl (81,480 gal) and store a VOL with a maximum TVP greater than 0.5 psia. However, per 40 CFR 60.110b(d)(3), Subpart Kb does not apply to vessels that are "permanently attached to mobile vehicles such as truck, railcars, barges, or ships". Therefore, this subpart does not apply to the two L-VOC storage tanks on the OSV.

Platform

Although the proposed crude surge tank on the platform [EPN (P) T-1] will have a capacity greater than 40,000 gallons, it will not be operated as a storage tank. Surge/relief tanks are different from traditional storage tanks since they do not typically hold liquids during normal operations. Such tanks will receive liquids only during a sudden surge event for which the tank will serve as "relief" and quickly receive the excess liquids for a brief period prior to being returned back to the pipeline. The surge tank will not normally contain any crude oil. Therefore, this subpart does not apply to the surge tank.

Additionally, the proposed fixed roof diesel-fuel storage tank [EPN (P) DT-1] will have a storage capacity of 20,000 gallons, but the TVP of diesel is significantly less than 2.2 psia. Therefore, the diesel-fuel tank will also not be subject to this rule. Finally, the "belly" tanks shown in the emission calculations are tanks that are part of the electric generators, portal crane, and firewater pump engine housing. They are not considered stand-alone tanks and are not subject to this regulation.

Subpart GG: Gas Turbines

The provisions of this subpart apply to all stationary gas turbines with a heat input at peak load greater than or equal to 10 MMBtu/hr based on the lower heating value (LHV) of the fuel. Any gas turbine which commences construction, modification, or reconstruction after October 3, 1977, is subject to requirements of this subpart.

The OSV will operate 2 stationary gas turbine electric generators each with a maximum heat input greater than 10 MMBtu/hr, whether firing L-VOC or S-VOC fuel. The platform will not operate a stationary gas turbine. Therefore, this rule applies to the 2 OSV gas turbine electric generators. However, as shown later, the 2 gas turbine generators are subject to NSPS KKKK and, therefore, are exempt from the requirements of this subpart.

Subpart IIII: Stationary Compression Ignition IC Engines

This subpart applies to compression ignition (CI), or diesel-fired, engines. There will be a total of 4 CI engines driving 4 non-emergency electric generators onboard the OSV, but only 2 of the engines will be operating during VLCC loading (i.e., emissions from the 2 operating engines are included in the air permit application). Additionally, there will be 4 CI engines located on the platform driving 2 non-emergency electric generators, 1 emergency firewater pump, and 1 portal crane. All 8 engines will be constructed after the applicable date of July 11, 2005. Therefore, the Deepwater Port Facility will comply with the applicable provisions of this subpart for these 8 CI engines.

Subpart JJJJ: Stationary Spark Ignition IC Engines

This subpart applies to spark ignition (SI), or gas (gasoline)-fired, engines that are constructed (ordered) after June 12, 2006 and that have a maximum engine power rating > 500 hp. There will be 2 gas turbine (GT) generators on board the OSV associated with the vapor processing module. These 2 GT generators will each have a power rating > 500 hp and combust L-VOC and S-VOC waste gas from the vapor processing module. The GT generators will supply electricity to the OSV and provide usable heat for the vapor recovery process. The Deepwater Port Facility will comply with applicable provisions of this subpart for the 2 GT generators on the OSV.

Subpart KKKK: Stationary Combustion Turbines

This subpart applies to stationary combustion turbines with a heat input at peak load equal to or greater than 10 MMBtu/hour based on the higher heating value (HHV) of the fuel, where only the heat input to the turbine is counted when determining peak heat input for applicability (i.e., additional heat input from an associated HRSG or duct burners are not counted). However, this subpart does apply to emissions from any associated HRSG and duct burners. To be subject to this subpart, the combustion turbine must have commenced construction, modification, or reconstruction after February 18, 2005.

The 2 GT electric generators onboard the OSV will each have a peak heat input of greater than 10 MMBtu/hr, whether firing L-VOC or S-VOC. Therefore, they are subject to applicable requirements of this subpart and, therefore, are exempt from requirements of NSPS Subpart GG.

NESHAP – 40 CFR Part 61

Subpart A: General Provisions

Any emission source subject to a specific NESHAP is also subject to applicable general provisions in this subpart. The proposed Deepwater Port Facility will have emissions of benzene as a result of handling and storing crude oil. Benzene is a listed applicable substance in 40 CFR 61.01(a). Therefore, a review of potentially applicable NESHAP rules was performed for the facility's emission sources.

Subpart V: Equipment Leaks of VHAP Service

The crude to be handled and loaded at the proposed Deepwater Port Facility will contain benzene at less than 10% by weight. As such, the pipeline components regulated by this subpart (e.g. valves, connectors, pumps, pressure relief devices, sampling connection systems, etc.) will not operate "In VHAP Service", as defined in 40 CFR 61.241. Therefore, this subpart does not apply. As there are no other applicable NESHAP rules that apply to the Deepwater Port Facility, Subpart A does not apply as well.

NESHAP for Source Categories ("MACT") – 40 CFR Part 63

Subpart A: General Provisions

This subpart applies to any facility that is subject to an individual subpart under 40 CFR 63. Because the diesel (compression ignition) engines at the proposed Deepwater Port Facility will be subject to Subpart ZZZZ, the facility will comply with applicable requirements in Subpart A.

Subpart H: Equipment Leaks of Organic HAPs

The provisions of this subpart apply to pumps, compressors, agitators, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, instrumentation systems, and control devices or closed vent systems required by this subpart that are intended to operate in organic HAP service 300 hours or more during the calendar year within a source subject to the provisions of a specific subpart in 40 CFR part 63 that references this subpart. No Part 63 subpart that applies to the Deepwater Port Facility references this Subpart H. Additionally, the facility will not operate pipeline components "In Organic HAP" service (i.e., piece of equipment either contains or contacts a fluid that is at least 5% by weight of total organic HAP). Therefore, this subpart does not apply.

Subpart Y: National Emission Standards for Marine Tank Vessel Loading Operations

As shown in Table 3-2 above, Texas Gulflink's proposed DWP is not expected to emit greater than 10 tons per year (tpy) of a single hazardous air pollutant (HAP) or greater than 25 tpy of an aggregate of all speciated HAPs. Therefore, the facility is considered a minor (area) source of HAPs. There are requirements under this subpart that apply to an area source, for marine tank vessel loading operations. For example, 40 CFR 63.562(b)(1)(i)–(iii) describe requirements for marine terminal vapor collection systems, the compatibility of marine vessel vapor collection equipment, and marine vessel vapor tightness. The proposed Deepwater Port Facility will meet these area source requirements by using the OSV vapor collection and processing module. However, as described below, it is Texas GulfLink's position that Subpart Y does not apply to the proposed Deepwater Port Facility.

For some marine tank vessel loading operations, 40 CFR Part 63, Subpart Y (referred to generally as "Subpart Y") provides the regulatory framework for setting HAP emissions limits. However, for the reasons stated below, Subpart Y does not apply to Texas GulfLink's proposed DWP. Rather, Texas GulfLink asserts that the HAP emissions from its proposed facility are more appropriately considered through a case-by-case MACT analysis (40 CFR Part 63, Subpart B), rather than under Subpart Y.

a. <u>Hazardous Air Pollution Regulation</u>

The Clean Air Act (CAA) section 112 authorizes the EPA to regulate the emission of HAPs. CAA section 112(d) requires EPA to promulgate regulations establishing emission standards for each category or subcategory of major sources listed by the EPA under Section 112(c) of the CAA (Listed Sources). The emission standards for Listed Sources are referred to as National Emission Standards for Hazardous Air Pollutants (NESHAP).

The NESHAP establish Maximum Achievable Control Technology (MACT) standards for setting emissions limits for new and existing Listed Sources. In those instances where EPA has not established a MACT standard applicable to a major source of HAPs (i.e. for sources that are not a Listed Source), CAA section 112(g) applies. Under section 112(g), the MACT emission limitation is developed on a "case-by-case" basis.

In 1995, EPA promulgated a specific MACT standard for HAP emissions from the "marine tank vessel loading operations" source category – a Listed Source. That standard is found in Subpart Y. Under Subpart Y, new, major "offshore loading terminals" are required to reduce HAP emissions from marine tank loading operations by 95 weight-percent. HAP emissions can be controlled using one of two primary methods: vapor recovery or vapor combustion (VR/VC). See 59 Federal Register 25004, 25007 (May 13, 1994).

However, VR/VC is an onshore or near-shore control technology that has never been achieved in practice at a DWP. VR/VC creates significant and unique human and environmental safety concerns at DWPs, especially those like Texas GulfLink that are located in unprotected waters and plan to use a manned platform for port security, surge protection and emergency/environmental response. Texas GulfLink proposes to control VOC and HAP emissions during VLCC loading operations by recovering up to 98% of the crude oil vapors and routing them to a vapor processing module onboard an Offshore Service Vessel (OSV) stationed alongside the VLCC for the duration of loading. Unlike VR/VC, this VOC vapor recovery and processing method has been successfully demonstrated for crude ship loading operations in the North Sea and elsewhere.

Furthermore, and importantly, the proposed Texas GulfLink project does not meet the definition of an "offshore loading terminal" as that term is defined in Subpart Y. Therefore, Subpart Y is not applicable to Texas GulfLink's proposed project.

b. <u>Texas GulfLink's Proposed DWP Does Not Meet the Definition of "Offshore Loading Terminal"</u>

EPA's Subpart Y regulations define an "offshore loading terminal" in 40 CFR §63.561 as follows:

> *Offshore loading terminal means a location that has at least one loading berth that is 0.81 km (0.5 miles) or more from the shore that is used for **mooring** a marine tank vessel and loading liquids from shore*. (emphasis added)

A critical part of the definition of an offshore loading terminal is the need for at least one "loading berth." The term "loading berth" is defined as follows:

> *Loading berth means the loading arms, pumps, meters, shutoff valves, relief valves, and other piping and* ***valves necessary to fill marine tank vessels.*** *The loading berth includes those items* ***necessary for an offshore loading terminal****.* (emphasis added).

Finally, a "terminal" is defined as "all loading berths at any land or sea based structure(s) that loads liquids in bulk onto marine tank vessels." Based on these definitions, an *offshore* loading terminal subject to Subpart Y requires at least one loading berth at a sea based structure. The Texas GulfLink project will not be an offshore loading terminal as contemplated by these definitions.

The Texas GulfLink DWP will load tankers using an SPM buoy system. The tankers will be physically moored to the floating SPMs, not any platform. Once a ship is moored to the SPM, the oil is loaded directly into the crude oil tankers using 1,100-foot flexible hoses. The equipment "necessary" for Texas GulfLink to "fill marine tank vessels" or to "load liquids in bulk" include the pumps (located and controlled onshore), the subsea pipeline, the PLEMs, the SPMs, and the 1,100-foot flexible hoses connecting the SPMs to the tankers. There are no "loading arms" or "pumps" at the SPM, only the lengthy floating flexible cargo hoses. The SPM-system proposed by Texas GulfLink does not fall within the meaning of a loading berth.

Although it is part of the overall design of the Texas GulfLink project, the offshore fixed platform is not necessary for loading operations and not a loading berth. The flow of oil from shore to the tankers is driven by nine (9) mainline crude pumps and three (3) booster pumps located onshore and fully controlled from an onshore control room—not the platform. Likewise, system shut-off valves are located onshore downstream of the main pumps. There are no "loading arms" or "pumps" on the platform itself. In fact, no equipment critical to loading is located solely on the platform. The platform itself will be 1.25 nautical miles (1.43 miles) away from the 2 SPM buoys where the tankers are moored.

While all DWP applicants propose to load tankers in the same manner – via an SPM system, some DWP applicants, like Texas GulfLink, recognize the benefits of incorporating a manned platform (at significant additional cost) into their projects. The platform provides support in the event of a discharge, accident, pipeline surge, or security event. The platform will not be necessary to the loading operation conducted through the SPM, as evidenced by the DWP applicants that propose an SPM-only DWP.

c. Case-by-Case MACT Analysis Under CAA 112(g)

Because the platform does not constitute a "loading berth" and because the DWP project proposed by Texas GulfLink does not fit within the meaning of an "offshore loading terminal" as those terms are defined in Subpart Y, a case-by-case MACT analysis under CAA 112(g) is the technically and legally more appropriate approach for establishing an emissions limit. Further, under a case-by-case MACT analysis, the Texas GulfLink project can be evaluated based on the unique aspects of its proposed design while taking into account the safety and operational issues. A case-by-case MACT analysis was performed for the proposed project and is under separate cover.

Subpart VV: Oil-Water Separators and Organic-Water Separators
The provisions of this subpart apply to the control of air emissions from oil-water separators and organic-water separators for which another subpart of 40 CFR 60, 61, or 63 references the use of this subpart for such air emission control. No Part 60, 61, or 63 subpart that applies to the proposed Deepwater Port Facility references Subpart VV. In addition, the facility will not operate an affected source under Subpart VV. Therefore, this rule does not apply.

Subpart YYYY: Stationary Combustion Turbines
This MACT subpart applies to stationary combustion turbines located at a major source of HAP. As shown in Table 3-2 above, the proposed Deepwater Port Facility is considered a minor (area) source of HAP. Therefore, this subpart does not apply.

Subpart ZZZZ: Stationary Reciprocating Internal Combustion Engines (RICE)
The proposed Deepwater Port Facility will operate 2 compression ignition (CI) engines (out of 4 on the OSV) driving 2 electric generators (2,100 hp and 1,500 hp) during VLCC loading. Additionally, on board the OSV will be 2 spark ignition (SI) engines driving the 2 GT generators associated with the vapor processing module. On the platform, the Facility will operate 4 CI engines driving 2 electric generators (968 hp each), 1 emergency firewater pump (350 hp), and 1 portal crane (425 hp).

Per 40 CFR 63.6590(c), an affected source that meets any of the criteria in paragraphs (c)(1) through (7) of the section must meet the requirements of Subpart ZZZZ by meeting the requirements of 40 CFR 60 (NSPS) Subpart IIII for CI engines or Subpart JJJJ for SI engines, and no further requirements apply under this subpart. Because the proposed Deepwater Port Facility will be an area source of HAP, all 8 CI engines and the 2 SI engines meet the condition of 40 CFR 63.6590(c)(1); therefore, compliance with NSPS Subparts IIII and JJJJ demonstrates compliance with this subpart.

6.2 Texas Air Regulations – 30 TAC

As previously mentioned, for deepwater port license applications, the US EPA administers CAA requirements and reviews air permit applications using the nearest adjacent State's regulations. Because Texas is the nearest adjacent state to the proposed Deepwater Port Facility, the TCEQ rules and regulations would potentially apply to the Deepwater Port Facility. The TCEQ air quality regulations in 30 TAC Chapters 101 through 122 were reviewed for potentially applicable requirements.

Chapter 101: General Air Quality Rules

Chapter 101 covers general rules that may apply to the Deepwater Port Facility. Some items included in Chapter 101 are nuisance rules, inspection fees, emission fees, emission events, scheduled maintenance, and expedited permitting. The proposed Deepwater Port Facility will comply with applicable requirements listed in this chapter.

Chapter 111: Control of Air Pollution from Visible Emissions and Particulate Matter

Chapter 111 establishes standards for visible emissions and opacity from stationary vents, gas flares, ships, and other sources, and for particulate matter (PM) emissions from selected sources, including material handling and construction. In general, the opacity from a new stationary vent or stack must not exceed 20%, averaged over a 6-minute period. The opacity from a ship stack must not exceed 30%, averaged over a 5-minute period, except during reasonable periods of engine startup. Although not applicable, gas flares must not have visible emissions for more than 5 minutes in any consecutive 2-hour period. The Deepwater Port Facility will comply with applicable opacity and PM emission limits specified in this chapter.

Chapter 112: Control of Air Pollution from Sulfur Dioxide

Chapter 112 outlines emission limits as well as monitoring, reporting, recordkeeping requirements, and net ground-level concentration limits for sulfur compounds. The proposed Deepwater Port Facility will demonstrate compliance with the net ground-level concentration of applicable sulfur compounds (e.g. SO_2, H_2S) through air dispersion modeling analysis.

Chapter 113: Standards of Performance for Hazardous Air Pollutants and for Designated Facilities and Pollutants

Chapter 113 incorporates by reference the federal NESHAP for Source Category standards contained in 40 CFR Part 63. The applicability analysis for the federal NESHAP regulations is presented in Section 6.1.

Chapter 115: Control of Air Pollution from Volatile Organic Compounds

Chapter 115 establishes rules for VOC emissions from specific sources, including vent gases, loading, and unloading of VOCs. Chapter 115 applies to emission sources located in designated nonattainment counties, and specific covered attainment counties listed in §115.10. The requirements listed in Chapter 115 do not apply to the proposed Deepwater Port Facility because the facility will not be located in a designated nonattainment area, nor in one of the specifically listed attainment counties.

Chapter 116: Control of Air Pollution by Permits for New Construction or Modification

Through Chapter 116, the TCEQ administers the New Source Review (NSR) air permitting programs in Texas, including NNSR and PSD. However, for sources located on the OCS outside of the state seaward boundary, the US EPA administers the PSD (pre-construction) program, using nearest adjacent state regulations. Therefore, Texas GulfLink is applying to the US EPA (Region 6) for a synthetic minor permit prior to commencing construction.

Chapter 117: Control of Air Pollution from Nitrogen Compounds

Chapter 117 Subchapter B establishes emission limits for nitrogen compounds emitted from major industrial, commercial, and institutional sources located in ozone nonattainment areas. Because the proposed Deepwater Port Facility will not be a major source nor located in a designated nonattainment area, the requirements of this chapter to not apply.

Chapter 118: Control of Air Pollution Episodes

Chapter 118 establishes requirements for generalized and local air pollution episodes. The requirements listed in Chapter 118 do not apply to the proposed Deepwater Port Facility because the facility's location will not be in any geographical area that might be affected by an air pollution episode.

Chapter 122: Federal Operating Permits Program

The proposed Texas GulfLink Deepwater Port Facility will be a Title V major source of regulated pollutants (i.e., single pollutant with emissions greater than 100 tons per year, see Table 3-1); thus, it will require a federal Title V operating permit. For sources located on the OCS outside of the state seaward boundary, the US EPA administers the Title V permit program, using nearest adjacent state regulations. Therefore, the Deepwater Port Facility is required to submit an initial Title V operating permit application to the US EPA (Region 6) prior to starting operation of the facility. This Title V permit application is included under separate cover.

7.0 AIR QUALITY IMPACTS ANALYSES

As described in Section 4.0 of this application, due to the vapor recovery control, VOC will be emitted at the Deepwater Port Facility less than the major source emissions threshold of 250 tpy, as defined in §52.21(b)(1)(i)(*a*). As show in Table 3-1, no other regulated pollutant will be emitted at a rate greater than 250 tpy. Therefore, the PSD permitting program does not apply to the Deepwater Port facility (i.e., the facility is minor with respect to PSD). Note that, although GHG (CO_2e) is a PSD-regulated pollutant, it does not have a defined significance threshold.

Although the Deepwater Facility does not trigger PSD, permitting requirements of the nearest adjacent state (Texas) must still be followed. These requirements include:

1. State-Best Available Control Technology (State-BACT) for applicable pollutants (Sec 5.0)
2. Off-property impacts analyses, demonstrating compliance with:
    a. State-NAAQS – applicable criteria pollutants of NO_2, CO, SO_2, $PM_{10/2.5}$, and Ozone (VOC)
    b. State Property Line Standard Analysis – applicable sulfur compounds of SO_2, H_2S, and H_2SO_4
    c. Health Effects Analysis (MERA) – applicable HAPs that have defined ESL limits

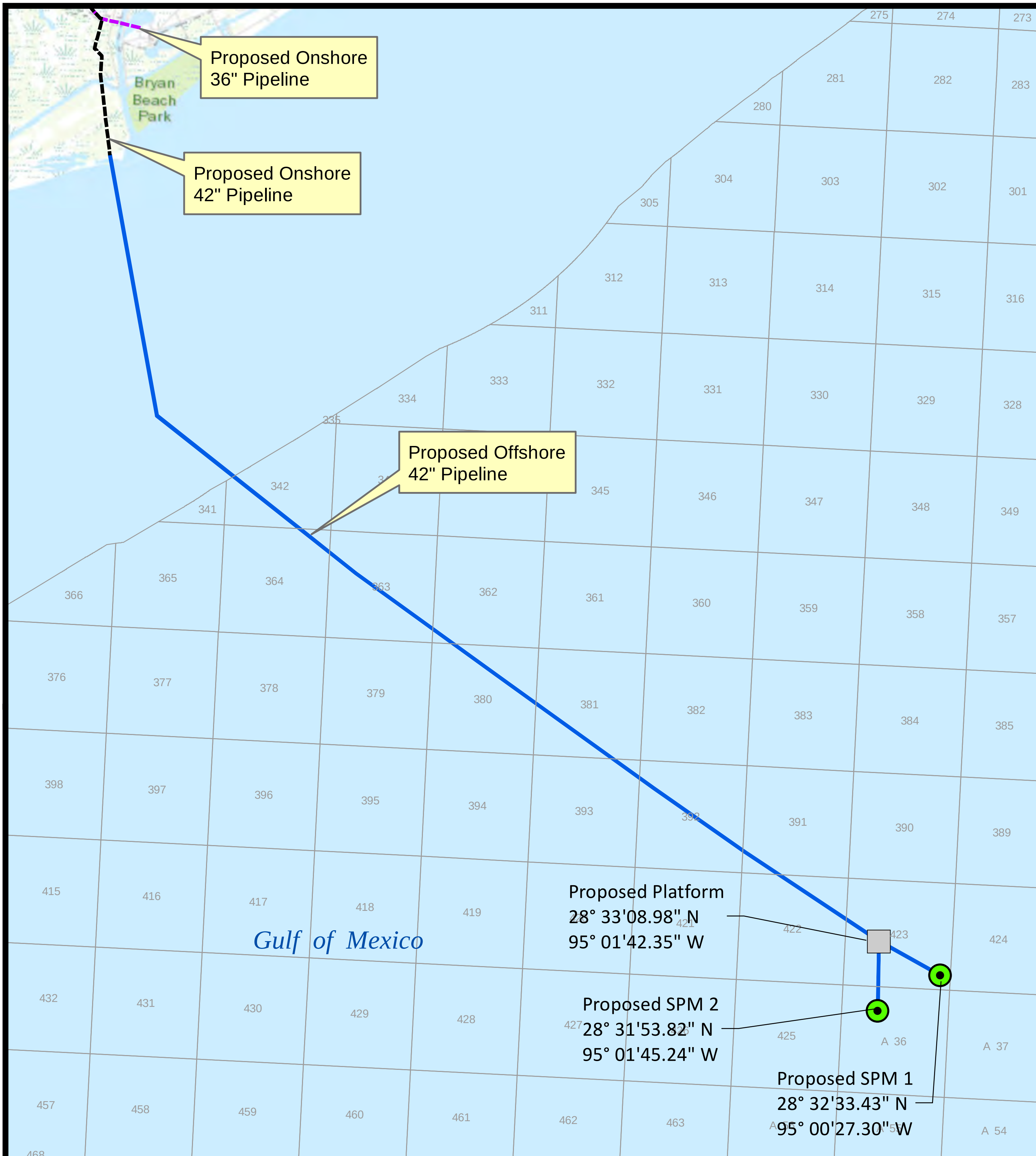
Because PSD does not apply, an additional impacts analysis per §52.21(o) and a federal Class I area impacts analysis per §52.21(p) are not required.

There is no *de minimis* air quality level (i.e., SIL) provided for ozone, although demonstration of the ozone NAAQS is required. Per §52.21(i)(5)(i) [see Note to Paragraph (c)(50)(i)(f)], for any net emissions increase of 100 tpy or more of VOC or NOx *subject to PSD*, the applicant is required to perform an ambient impact analysis, including the gathering of ambient air quality data. Because VOC and NOx are not subject to PSD for this project, the referenced ozone impacts analysis is not required.

Appendix D presents a report describing the off-property impacts analyses performed for the proposed Texas GulfLink Deepwater Port Facility (i.e., a minor new source) following TCEQ's requirements. These analyses include dispersion modeling using the EPA-accepted Offshore and Coastal Dispersion (OCD) model.

APPENDICES

Appendix A
Application Figures (Area Map, Simplified PFD)



Texas GulfLink, LLC
Dallas, Texas

Texas GulfLink

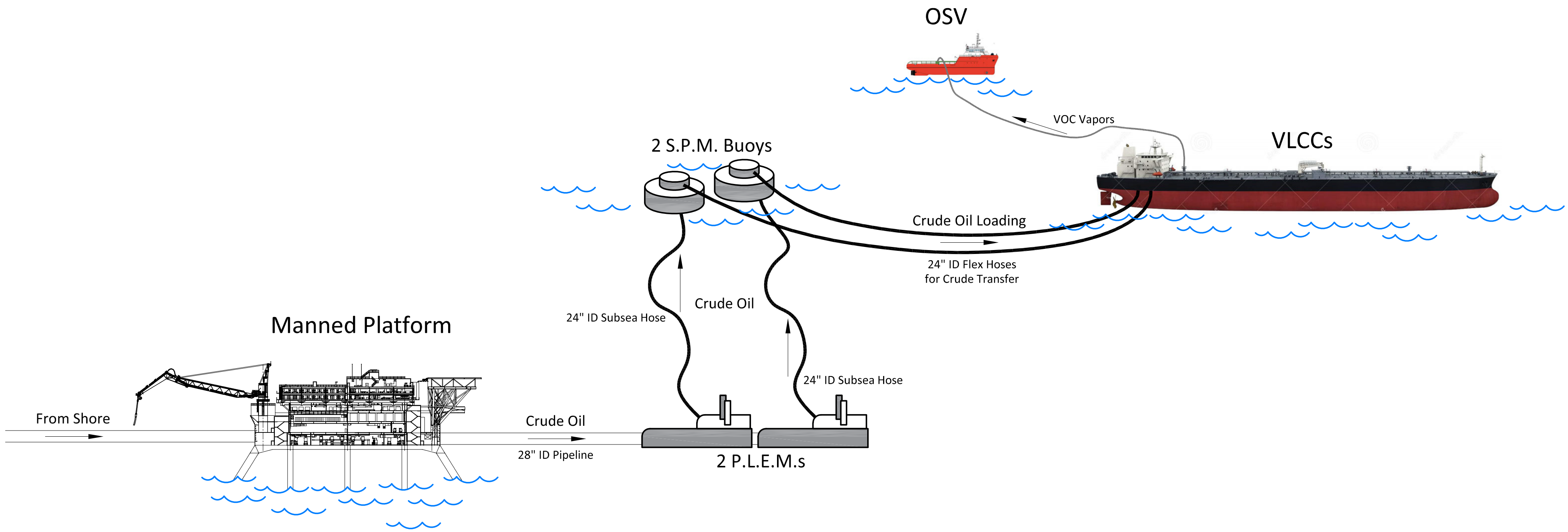
Offshore Location Map

N

0 3
Miles

Drawn: CAL
Checked: JLS
Date: 5/7/2019
Approved: JLS
Dwg. No.: A17073-60

Figure 1



Sentinel Midstream
Dallas, Texas

Texas GulfLink

Simplified Process Flow Diagram

N	NOT TO SCALE	Drawn: CPL	Checked: JLS	
		Date: 05/09/19	Approved: JLS	
		Dwg. No.: A17073-62	**Figure 2**	

Appendix B
Detailed Emission Rate Calculations
(includes specification sheets)

Texas GulfLink, LLC
Facility Emissions Summary

EPN *	Source	CO_2e		PM_{10}		$PM_{2.5}$		SO_2		NOx		CO		Total VOC	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
(P) M-1	Marine Loading													101.26	208.10
(P) G-1	Generator 1	-	2,428	0.16	0.70	0.16	0.70	0.01	0.03	4.96	21.72	2.78	12.20	0.13	0.58
(P) G-2	Generator 2	-	2,428	0.16	0.70	0.16	0.70	0.01	0.03	4.96	21.72	2.78	12.20	0.13	0.58
(P) C-1	Crane 1	-	2,132	0.14	0.61	0.14	0.61	0.01	0.02	2.59	11.32	2.45	10.71	0.21	0.92
(P) DT-1	Day Tank 1													0.001	0.01
(P) BT-1	Belly Tank 1													0.0002	0.001
(P) BT-2	Belly Tank 2													0.0002	0.001
(P) BT-3	Belly Tank 3													0.0002	0.001
(P) BT-4	Belly Tank 4													0.00002	0.0001
(P) T-1	Surge Tank													0.40	1.74
(P) FWP-1	MSS - Emerg Firewater Pump Maintenance	-	20	0.12	0.01	0.12	0.01			2.12	0.11	2.01	0.10	0.18	0.01
(P) P-1	MSS - Pigging Operations													83.76	0.50
(P) F-1	Platform Fugitive Emissions													0.03	0.12
(P) F-2	SPM System Fugitives													0.10	0.44
(P) S-1	Sampling Activities													0.10	0.05
(P) PM-1	MSS - Pump Maintenance													4.00	0.002
(P) MSS-1	MSS - Abrasive Blasting / Painting			0.01	0.06	0.002	0.01							0.06	0.26
(OSV) UM-1	Uncontrolled Marine Loading (Bad Weather)													3,601.55	31.03
(OSV) GT-1	GT Generator 1	-	3,860	0.30	1.31	0.30	1.31	0.25	0.19	3.48	8.16	2.65	6.21	0.42	0.98
(OSV) GT-2	GT Generator 2		3,860	0.30	1.31	0.30	1.31	0.14	0.19	3.48	8.16	2.65	6.21	0.42	0.98
(OSV) EDG-1	CAT 3516C - No. 1	-	5,642	0.33	1.46	0.33	1.46	0.01	0.054	10.37	45.44	5.82	25.51	0.28	1.21
(OSV) EDG-3	CAT 3512C - No. 1	-	1,018	0.05	0.21	0.05	0.21	0.002	0.008	1.46	6.40	0.82	3.59	0.04	0.17
(OSV) F-1	OSV Fugitive Emissions													0.02	0.11
(OSV) F-2	OSV Fugitive Emissions - Hose Disconnects													0.39	0.03
(OSV) MSS-2	MSS - Other Misc. Maintenance													9.37	0.81
	TOTAL EMISSIONS (TPY)	**0**	**21,388**	**1.57**	**6.37**	**1.56**	**6.31**	**0.41**	**0.51**	**33.42**	**123.04**	**21.97**	**76.73**	**3,802.85**	**248.64**

* P stands for Platform and OSV stands for Offshore Service Vessel

Texas GulfLink, LLC
Facility Emissions Summary

EPN *	Source	H_2S		1,3-Butadiene		Acetaldehyde		Acrolien		Benzene		Isopropylbenzene		Ethylbenzene		Formaldehyde		Hexane (-n)		Naphthalene		PAH		Propylene Oxide		2,2,4-Trimethylpentane (isooctane)		Toluene		Xylene (-m)	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
(P) M-1	Marine Loading	0.0025	0.0012							0.45	0.92	0.003	0.01	0.03	0.06			2.31	4.75							0.04	0.08	0.22	0.45	0.09	0.18
(P) G-1	Generator 1					0.0002	0.001			0.01	0.02					0.001	0.002											0.002	0.01	0.002	0.01
(P) G-2	Generator 2					0.0002	0.001			0.01	0.02					0.001	0.002											0.002	0.01	0.002	0.01
(P) C-1	Crane 1															0.004	0.02														
(P) DT-1	Day Tank 1																														
(P) BT-1	Belly Tank 1																														
(P) BT-2	Belly Tank 2																														
(P) BT-3	Belly Tank 3																														
(P) BT-4	Belly Tank 4																														
(P) T-1	Surge Tank									0.002	0.01			0.0001	0.001			0.01	0.04									0.001	0.004	0.0003	0.002
(P) FWP-1	MSS - Emerg Firewater Pump Maintenance																														
(P) P-1	MSS - Pigging Operations									0.37	0.002							1.91	0.01									0.18	0.001		
(P) F-1	Platform Fugitive Emissions										0.00071							0.0005	0.002										0.001177	0.0004	0.002
(P) F-2	SPM System Fugitives																														
(P) S-1	Sampling Activities																														
(P) PM-1	MSS - Pump Maintenance																														
(P) MSS-1	MSS - Abrasive Blasting / Painting																														
(OSV) UM-1	Uncontrolled Marine Loading (Bad Weather)	0.09	0.0002							15.89	0.14	0.12	0.001	1.07	0.01			82.23	0.71							1.37	0.01	7.78	0.07	3.12	0.03
(OSV) GT-1	GT Generator 1			0.00003	0.00002	0.0029	0.002	0.0005	0.0003	0.0009	0.0006			0.0023	0.002	0.051	0.038			0.00009	0.0001	0.00016	0.0001	0.0021	0.002			0.009	0.007	0.005	0.003
(OSV) GT-2	GT Generator 2			0.0000	0.0000	0.0029	0.0022	0.0005	0.0003	0.0009	0.001			0.0023	0.0017	0.051	0.038			0.0001	0.000	0.0002	0.000	0.0021	0.0016			0.009	0.007	0.0046	0.003
(OSV) EDG-1	CAT 3516C - No. 1					0.0002	0.0008			0.005	0.024					0.0006	0.002											0.002	0.009	0.001	0.006
(OSV) EDG-3	CAT 3512C - No. 1					0.00003	0.0001			0.001	0.003					0.0001	0.000											0.000	0.001	0.0002	0.001
(OSV) F-1	OSV Fugitive Emissions	0.0000001	0.000001							0.0001	0.001	0.00002	0.0001	0.0001	0.0004			0.0005	0.002							0.00002	0.0001	0.0002	0.001	0.0003	0.002
(OSV) F-2	OSV Fugitive Emissions - Hose Disconnects	0.00000004	0.0000002							0.002	0.0002	0.00001	0.000001	0.0001	0.00001			0.01	0.001							0.0001	0.00001	0.001	0.0001	0.0003	0.00003
(OSV) MSS-2	MSS - Other Misc. Maintenance																														
	TOTAL EMISSIONS (TPY)	**0.093**	**0.001**	**0.000**	**0.000**	**0.006**	**0.007**	**0.0009**	**0.0007**	**16.726**	**1.141**	**0.125**	**0.008**	**1.100**	**0.075**	**0.108**	**0.099**	**86.470**	**5.516**	**0.0002**	**0.0001**	**0.0003**	**0.0002**	**0.0042**	**0.0031**	**1.406**	**0.091**	**8.204**	**0.559**	**3.221**	**0.237**

* P stands for Platform and OSV stands for Offshore Service Vessel

Texas GulfLink, LLC
Offshore Platform
Marine Loading

EPN	Description
(P) M-1	Marine Loading

AP-42, Chapter 5, Section 5.2
Transportation and Marketing of Petroleum Liquids
Equation 2 was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges.

$C_L = C_A + C_G$
C_L = total loading loss (lb/10^3 gal of crude oil loaded)

C_A = arrival emission factor (lb/10^3 gal loaded)

C_A =	0.86	Taken from Table 5.2-3, based on "Uncleaned" and "Volatile", assumes no ballasting.
		Vapor pressure is > 1.5 psia.

C_G = generated emission factor (lb/10^3 gal loaded)
Equation 3: $C_G = 1.84*(0.44P-0.42)*((MG)/T)$

P =	8.98	psia	Average true vapor pressure for Crude Oil estimated using TANKS 4.09d and information provided by Abadie-Williams LLC.	
P =	10.00	psia	Maximum true vapor pressure for Crude Oil estimated using AP-42, Figure 7.1-13 and information provided by Abadie-Williams LLC.	Based on 80 deg F and RVP10.
M =	50	lb/lb-mol	VMW of loaded crude	
G =	1.02	dimensionless	AP-42	
T =	529.67	deg R	Average temperature of loaded crude provided by Abadie-Williams LLC.	
T =	539.67	deg R	Maximum temperature of loaded crude provided by Abadie-Williams LLC.	
C_G =	0.63	**ANNUAL EMISSION FACTOR**		
C_G =	0.69	**MAXIMUM EMISSION FACTOR**		

ANNUAL
C_L = 1.49 lb TOC/10^3 gal loaded 1.26 lb VOC/10^3 gal loaded
MAXIMUM
C_L = 1.55 lb TOC/10^3 gal loaded 1.32 lb VOC/10^3 gal loaded

Per Chapter 5, emission factors derived from Equation 3 and Table 5.2-3 represent TOC. When specific vapor composition information is not available, the VOC emission factor can be estimated by taking 85% of the TOC factor.

Pollutant	Maximum Emission Factor (lb/10^3 gal)	Annual Emission Factor (lb/10^3 gal)	Maximum Crude Loading Rate (bbl/hr)	Annual Crude Loaded (bbl/yr)	MW (lb/lbmol)	Average Concentration of H_2S in Crude (ppmv)	Maximum Concentration of H_2S in Crude (ppmv)	VRV Recovery Efficiency (%)	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
VOC	1.32	1.26	85,000	365,000,000	-	-	-	97.85	47.51	101.26	208.10
Benzene	-	-	-	-	-	-	-		0.21	0.45	0.92
Ethylbenzene	-	-	-	-	-	-	-		0.01	0.03	0.06
n-Hexane	-	-	-	-	-	-	-		1.08	2.31	4.75
Isooctane	-	-	-	-	-	-	-		0.02	0.04	0.08
Isopropyl benzene	-	-	-	-	-	-	-		0.00	0.00	0.01
Toluene	-	-	-	-	-	-	-		0.10	0.22	0.45
Xylene	-	-	-	-	-	-	-		0.04	0.09	0.18
H_2S	-	-	-	-	34.1	5	25		0.00	0.00	0.00

Annual Crude Loading Rate provided by Abadie-Williams LLC.
Maximum Crude Loading Rate provided by Abadie-Williams LLC.
Maximum and Annual Concentration of H_2S in Crude is an assumption.

	Tanks 4.09d (rev)	WTI S/T 6008	WTI - Pecos River	WTI - Houston	Bakken 2016
HAP	Wt Frac	Wt Frac	Wt Frac	Wt Frac	Wt Frac
Benzene	0.0044	0.00398	0.00444	0.00256	0.0017
Ethylbenzene	0.0003	0.0025			
Hexane (-n)	0.0228	0.01507	0.01932	0.01481	
Isooctane	0.0004	0.01748			
Isopropyl benzene	0.0000				
Toluene	0.0022	0.00831			0.0067
Xylene (-m)	0.0009	0.00672			
Unidentified Components	0.9637	0.93483			
Cyclohexane	0.0053	0.01111			
1,2,4-Trimethylbenzene	0.0000				
Sum Wt Fac	1.0000				

HAP	Highest WT FRAC	Source
Benzene	0.0044	Tanks 4.09d
Ethylbenzene	0.0025	WTI S/T 6008
Hexane (-n)	0.0228	Tanks 4.09d
Isooctane	0.0175	WTI S/T 6008
Isopropyl benzene	0.0000	Tanks 4.09d
Toluene	0.0083	WTI S/T 6008
Xylene (-m)	0.0067	WTI S/T 6008
Unidentified Comp	0.9637	Tanks 4.09d
Cyclohexane	0.0111	WTI S/T 6008
1,2,4-Trimethylbenzene	0.0000	Tanks 4.09d
Sum Wt Fac	1.0371	

Texas GulfLink, LLC
Offshore Platform
Electric Generators

Two 650 KW diesel-fired electric generators are used to supply electricity to the platform. Only one will operate at a time.

EPN	Description
(P) G-1	Generator 1
(P) G-2	Generator 2

Given:

Power Output of Each Generator	650	KW(1)
Power Output of Each Turbine	968	Hp
Power Output of Each Turbine	722	KW(2)
Operation Time	8,760	hrs
Firing Rate:	6.78	MMBtu/hr(3)

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation for One Engine:

Pollutant	Emission Factor(4) [g/kW-hr]	Emission Factor(2) [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate (1 Generator) [lb/hr]	Dividing Max Hourly Rate Across 2 Generators	Annual Emission Rate (1 Generator) [tpy]	Dividing Annual Rate Across 2 Generators (1 Generator) [tpy]
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.32	0.32	**0.16**	1.39	**0.70**
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.32	0.32	**0.16**	1.39	**0.70**
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.01	0.01	**0.01**	0.05	**0.03**
CO	3.5	2.61	0.01	NSPS 4I	5.57	5.57	**2.78**	24.40	**12.20**
NMHC + NOx	6.40	-	-	NSPS 4I	-	-	**-**	-	**-**
NO_x	6.23	4.65	0.01	NSPS 4I	9.92	9.92	**4.96**	43.45	**21.72**
Total VOC	0.17	0.12	0.0003	NSPS 4I	0.27	0.27	**0.13**	1.16	**0.58**

Greenhouse Gases Emission Calculation for One Engine:

			Emissions				
Pollutant	Emission Factor(5) (kg/MMBtu)	Global Warming Potentials(6)	Average(7) (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e(8) (tonnes/yr)	Dividing Annual Rate Across 2 Generators (tpy)
CO_2	73.96	1	1,105	1,105	4,839	4,391	2,420
CH_4	3.00E-03	25	0.04	0.04	5	4	2
N_2O	6.00E-04	298	0.01	0.01	12	11	6
CO_2e	--	--	1,105	1,105	4,856	4,406	**2,428**

Toxic Air Pollutant Emission Calculation for One Engine:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Acetaldehyde	0.0000252	AP-42, Ch. 3.4	0.0002	0.0002	0.001
Benzene	0.000776	AP-42, Ch. 3.4	0.005	0.005	0.02
Formaldehyde	0.0000789	AP-42, Ch. 3.4	0.001	0.001	0.002
Toluene	0.000281	AP-42, Ch. 3.4	0.002	0.002	0.01
Xylene	0.000193	AP-42, Ch. 3.4	0.001	0.001	0.01

Notes:
(1) Provided by Abadie-Williams LLC
(2) 1.341 hp/Kw
(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.
(4) NMHC + NO_x, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NO_x factor used for VOC and NOx by assuming 97% NO_x and 3% VOC, based on the ratios of NO_x and VOC AP-42 emission factors in Chapter 3.4.
(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.
(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
(7) Emissions converted from kg to lbs using 2.20462 lb/kg.
(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Platform
Portal Crane

One (1) 425 Hp portal crane is used on the platform.

EPN	Description
(P) C-1	Crane 1

Given:

Power Output of Each Engine	316.93	KW(1)
Power Output of Each Engine	425.00	Hp(2)
Operation Time	8,760	hrs
Firing Rate:	2.98	MMBtu/hr(3)

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation for One Engine:

Pollutant	Emission Factor(4) [g/kW-hr]	Emission Factor(2) [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.14	0.14	0.61
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.14	0.14	0.61
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.01	0.01	0.02
CO	3.5	2.61	0.01	NSPS 4I	2.45	2.45	10.71
NMHC + NOx	4.00	-	-	NSPS 4I	-	-	-
NO_x	3.70	2.76	0.01	NSPS 4I	2.59	2.59	11.32
Total VOC	0.30	0.22	0.0005	NSPS 4I	0.21	0.21	0.92

Greenhouse Gases Emission Calculation for One Engine:

Pollutant	Emission Factor(5) (kg/MMBtu)	Global Warming Potentials(6)	Emissions Average(7) (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e(8) (tonnes/yr)
CO_2	73.96	1	485.08	485.08	2124.67	1928.01
CH_4	3.00E-03	25	0.02	0.02	2.15	1.96
N_2O	6.00E-04	298	0.004	0.004	5.14	4.66
CO_2e	--	--	485.11	485.11	2131.96	1934.63

Toxic Air Pollutant Emission Calculation for One Engine:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Formaldehyde	0.00118	AP-42, Ch. 3.3	0.004	0.004	0.02

Notes:
(1) Calculated using 1.341 hp/kW.
(2) Provided by Abadie-Williams LLC
(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.
(4) NMHC + NOx, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NOx factor used for VOC and NOx by assuming 92% NOx and 8% VOC, based on the ratios of NOx and VOC AP-42 emission factors in Chapter 3.4. Assumes Tier III.
(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.
(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.
(7) Emissions converted from kg to lbs using 2.20462 lb/kg.
(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Platform
Diesel Fuel Tank for Engines

Tank Data:

EPN	Description	Tank Type	Stored Product	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) DT-1	Day Tank 1	Vertical Fixed Roof	Diesel	8,760	20,000	300,000

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Calculation for One Tank:

Pollutant	VOC Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	11.04	0.001	0.001	0.01
Benzene	0.02	2.E-06	2.E-06	1.E-05
Ethylbenzene	0.04	4.E-06	4.E-06	2.E-05
n-Hexane	0.00	5.E-07	5.E-07	2.E-06
Toluene	0.25	0.00003	0.00003	0.0001
Xylenes	0.66	0.0001	0.0001	0.0003

Texas GulfLink, LLC
Offshore Platform
Diesel Fuel Tanks for Engines (Generators, Crane, Firewater Pump)

Tank Data:

EPN	Description	Tank Type	Stored Product	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) BT-1	Belly Tank 1	Horizontal Fixed Roof	Diesel	8,760	1,000	99,667
(P) BT-2	Belly Tank 2	Horizontal Fixed Roof	Diesel	8,760	1,000	99,667
(P) BT-3	Belly Tank 3	Horizontal Fixed Roof	Diesel	8,760	1,000	99,667
(P) BT-4	Belly Tank 4	Horizontal Fixed Roof	Diesel	8,760	1,000	1,000

Calculation Methodology:
Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Summary for one Belly Tank (BT-1, BT-2, BT-3):

Pollutant	Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	1.50	0.0002	0.0002	0.001
Benzene	0.003	3.E-07	3.E-07	1.E-06
Ethylbenzene	0.005	5.E-07	5.E-07	2.E-06
n-Hexane	0.001	7.E-08	7.E-08	3.E-07
Toluene	0.03	4.E-06	4.E-06	2.E-05
Xylenes	0.09	1.E-05	1.E-05	4.E-05

Emission Summary for one Belly Tank (BT-4):

Pollutant	Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	0.16	0.00002	0.00002	0.0001
Benzene	0.0003	4.E-08	4.E-08	2.E-07
Ethylbenzene	0.001	6.E-08	6.E-08	3.E-07
n-Hexane	0.0001	7.E-09	7.E-09	3.E-08
Toluene	0.004	4.E-07	4.E-07	2.E-06
Xylenes	0.01	1.E-06	1.E-06	5.E-06

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	(P) BT-1, (P) BT-2, (P) BT-3
City:	Freeport
State:	Texas
Company:	Sentinel Midstream
Type of Tank:	Horizontal Tank
Description:	Belly Tank for Generators and Crane, emissions represent one tank.

Tank Dimensions

Shell Length (ft):	10.00
Diameter (ft):	4.00
Volume (gallons):	1,000.00
Turnovers:	99.67
Net Throughput(gal/yr):	99,666.67
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) BT-1, (P) BT-2, (P) BT-3 - Horizontal Tank
Freeport, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	71.54	68.18	74.90	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0100	0.0490	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0000	0.0020	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0001	0.0032	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0000	0.0004	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4684	0.4239	0.5168	92.1300	0.0003	0.0229	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.0081	0.0074	0.0079	134.5138	0.9866	0.8632	189.60	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0029	0.0594	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) BT-1, (P) BT-2, (P) BT-3 - Horizontal Tank
Freeport, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	0.1344
Vapor Space Volume (cu ft):	80.0406
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0213
Vented Vapor Saturation Factor:	0.9990
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	80.0406
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	7.1383
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	10.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0213
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.0019
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0085
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0105
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9990
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0095
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	1.3650
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Annual Net Throughput (gal/yr.):	99,666.6667
Annual Turnovers:	99.6667
Turnover Factor:	0.4677

Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	1.4995

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) BT-1, (P) BT-2, (P) BT-3 - Horizontal Tank
Freeport, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Hexane (-n)	0.00	0.00	0.00
Benzene	0.00	0.00	0.00
Toluene	0.03	0.00	0.03
Ethylbenzene	0.00	0.00	0.00
Xylene (-m)	0.08	0.01	0.09
1,2,4-Trimethylbenzene	0.07	0.01	0.07
Unidentified Components	1.18	0.12	1.29
Distillate fuel oil no. 2	1.37	0.13	1.50

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	(P) BT-4
City:	Freeport
State:	Texas
Company:	Sentinel Midstream
Type of Tank:	Horizontal Tank
Description:	Belly Tank for Firewater Pump

Tank Dimensions

Shell Length (ft):	10.00
Diameter (ft):	4.00
Volume (gallons):	1,000.00
Turnovers:	1.00
Net Throughput(gal/yr):	1,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) BT-4 - Horizontal Tank
Freeport, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	71.54	68.18	74.90	69.66	0.0095	0.0085	0.0105	130.0000			188.00	Option 1: VP70 = .009 VP80 = .012
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0100	0.0490	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0000	0.0020	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0001	0.0032	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0000	0.0004	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Toluene						0.4684	0.4239	0.5168	92.1300	0.0003	0.0229	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						0.0081	0.0074	0.0079	134.5138	0.9866	0.8632	189.60	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0029	0.0594	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) BT-4 - Horizontal Tank
Freeport, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	0.1344
Vapor Space Volume (cu ft):	80.0406
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0213
Vented Vapor Saturation Factor:	0.9990
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	80.0406
Tank Diameter (ft):	4.0000
Effective Diameter (ft):	7.1383
Vapor Space Outage (ft):	2.0000
Tank Shell Length (ft):	10.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0213
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.0019
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0085
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0105
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9990
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0095
Vapor Space Outage (ft):	2.0000
Working Losses (lb):	0.0293
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0095
Annual Net Throughput (gal/yr.):	1,000.0000
Annual Turnovers:	1.0000
Turnover Factor:	1.0000

Tank Diameter (ft):	4.0000
Working Loss Product Factor:	1.0000
Total Losses (lb):	0.1637

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) BT-4 - Horizontal Tank
Freeport, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	0.03	0.13	0.16
Hexane (-n)	0.00	0.00	0.00
Benzene	0.00	0.00	0.00
Toluene	0.00	0.00	0.00
Ethylbenzene	0.00	0.00	0.00
Xylene (-m)	0.00	0.01	0.01
1,2,4-Trimethylbenzene	0.00	0.01	0.01
Unidentified Components	0.03	0.12	0.14

Texas GulfLink, LLC
Offshore Platform
Surge Tank

Tank Data:

EPN	Description	Tank Type	Stored Product	MW of Crude (lb/lbmol)	Average TVP of Crude (psia)	Annual Operating Hours	Volume (gal)	Annual Throughput (gal/yr)
(P) T-1	Surge Tank	Fixed Roof	Crude oil (RVP 10)	50	8.98	8,760	84,000	84,000

Volume and throughput provided by Abadie-Williams LLC.

Calculation Methodology:

Note: Emissions are based on AP-42, Chapter 7, November 2006.
Average Hourly Rate [lb/hr] = TANKS Emission Report (lb/yr) / 8760 hrs/yr
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = TANKS Emission Report (lb/yr) / 2000 lb/ton

Emission Calculation for One Tank:

Pollutant	VOC Emissions [lbs/yr]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Total VOC	3,489.80	0.40	0.40	1.74
2,2,4-Trimethylpentane (isooctane)	0.00	0E+00	0E+00	0E+00
Benzene	15.39	0.002	0.002	0.01
Ethylbenzene	1.03	0.0001	0.0001	0.001
Hexane (-n)	79.68	0.009	0.009	0.04
Isopropyl benzene	0.12	0.00001	0.00001	0.0001
Toluene	7.54	0.001	0.001	0.004
Xylene (-m)	3.02	0.0003	0.0003	0.002

Hydrogen Sulfide Emissions:

Molecular Weight of H_2S (lb/lbmol): 34.1
Average Concentration of H_2S in Crude (ppmv): 5
Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	2.E-06	2.E-06	1.E-05

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	(P) T-1 Fixed
City:	Galveston
State:	Texas
Company:	Sentinel Midstream
Type of Tank:	Vertical Fixed Roof Tank
Description:	Surge Tank

Tank Dimensions

Shell Height (ft):	40.00
Diameter (ft):	19.00
Liquid Height (ft) :	40.00
Avg. Liquid Height (ft):	20.00
Volume (gallons):	84,000.00
Turnovers:	1.00
Net Throughput(gal/yr):	84,000.00
Is Tank Heated (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good
Roof Color/Shade:	White/White
Roof Condition:	Good

Roof Characteristics

Type:	Cone
Height (ft)	0.00
Slope (ft/ft) (Cone Roof)	0.06

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Galveston, Texas (Avg Atmospheric Pressure = 14.7 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Crude oil (RVP 10)	All	71.54	68.18	74.90	69.66	8.9800	8.5126	9.4668	50.0000			207.00	Option 4: RVP=10
1,2,4-Trimethylbenzene						0.0320	0.0282	0.0363	120.1900	0.0033	0.0000	120.19	Option 2: A=7.04383, B=1573.267, C=208.56
Benzene						1.5948	1.4590	1.7409	78.1100	0.0060	0.0044	78.11	Option 2: A=6.905, B=1211.033, C=220.79
Cyclohexane						1.6424	1.5056	1.7893	84.1600	0.0070	0.0053	84.16	Option 2: A=6.841, B=1201.53, C=222.65
Ethylbenzene						0.1604	0.1435	0.1790	106.1700	0.0040	0.0003	106.17	Option 2: A=6.975, B=1424.255, C=213.21
Hexane (-n)						2.5633	2.3578	2.7832	86.1700	0.0193	0.0228	86.17	Option 2: A=6.876, B=1171.17, C=224.41
Isooctane									114.2200	0.0010	0.0000	114.22	
Isopropyl benzene						0.0732	0.0650	0.0824	120.2000	0.0010	0.0000	120.20	Option 2: A=6.93666, B=1460.793, C=207.78
Toluene						0.4684	0.4239	0.5168	92.1300	0.0100	0.0022	92.13	Option 2: A=6.954, B=1344.8, C=219.48
Unidentified Components						10.2985	10.2485	10.2788	49.2353	0.9344	0.9641	226.57	
Xylene (-m)						0.1341	0.1198	0.1498	106.1700	0.0140	0.0009	106.17	Option 2: A=7.009, B=1462.266, C=215.11

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

Annual Emission Calcaulations	
Standing Losses (lb):	2,816.2932
Vapor Space Volume (cu ft):	5,726.6898
Vapor Density (lb/cu ft):	0.0788
Vapor Space Expansion Factor:	0.1815
Vented Vapor Saturation Factor:	0.0942
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	5,726.6898
Tank Diameter (ft):	19.0000
Vapor Space Outage (ft):	20.1979
Tank Shell Height (ft):	40.0000
Average Liquid Height (ft):	20.0000
Roof Outage (ft):	0.1979
Roof Outage (Cone Roof)	
Roof Outage (ft):	0.1979
Roof Height (ft):	0.0000
Roof Slope (ft/ft):	0.0625
Shell Radius (ft):	9.5000
Vapor Density	
Vapor Density (lb/cu ft):	0.0788
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	8.9800
Daily Avg. Liquid Surface Temp. (deg. R):	531.2087
Daily Average Ambient Temp. (deg. F):	69.6417
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	529.3317
Tank Paint Solar Absorptance (Shell):	0.1700
Tank Paint Solar Absorptance (Roof):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,404.1667
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.1815
Daily Vapor Temperature Range (deg. R):	13.4398
Daily Vapor Pressure Range (psia):	0.9542
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	8.9800
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	8.5126
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	9.4668
Daily Avg. Liquid Surface Temp. (deg R):	531.2087
Daily Min. Liquid Surface Temp. (deg R):	527.8487
Daily Max. Liquid Surface Temp. (deg R):	534.5686
Daily Ambient Temp. Range (deg. R):	9.3833
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.0942
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	8.9800
Vapor Space Outage (ft):	20.1979

Working Losses (lb):	673.5023
Vapor Molecular Weight (lb/lb-mole):	50.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	8.9800
Annual Net Throughput (gal/yr.):	84,000.0000
Annual Turnovers:	1.0000
Turnover Factor:	1.0000
Maximum Liquid Volume (gal):	84,000.0000
Maximum Liquid Height (ft):	40.0000
Tank Diameter (ft):	19.0000
Working Loss Product Factor:	0.7500
Total Losses (lb):	3,489.7956

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

(P) T-1 Fixed - Vertical Fixed Roof Tank
Galveston, Texas

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Crude oil (RVP 10)	673.50	2,816.29	3,489.80
Hexane (-n)	15.38	64.30	79.68
Benzene	2.97	12.42	15.39
Isooctane	0.00	0.00	0.00
Toluene	1.45	6.08	7.54
Ethylbenzene	0.20	0.83	1.03
Xylene (-m)	0.58	2.44	3.02
Isopropyl benzene	0.02	0.10	0.12
1,2,4-Trimethylbenzene	0.03	0.14	0.17
Cyclohexane	3.57	14.93	18.50
Unidentified Components	649.29	2,715.06	3,364.35

Texas GulfLink, LLC
Offshore Platform
Firewater Pump

Engine Data

EPN	Description	Fuel Type	Brake Hp	Annual Operating Hours	Specific Fuel Consumption (Btu/hp-hr)[a]	Heat Input (MMBtu/hr)[b]	Annual Heat Rate (MMBtu/yr)[c]
(P) FWP-1	MSS - Firewater Pump	Diesel	350	100	7,000	2.45	245

[a] Given that specific data is unavailable for this engine, this calculation uses the average brake-specific fuel consumption from AP-42 Table 3.3-1, Footnote a

[b] calculated; (Btu/hp-hr * hp) / 1,000,000

[c] calculated; MMBtu/hr * hr/yr

Calculation Methodology:

Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation:

Pollutant	Emission Factor [d] [g/kW-hr]	Emission Factor [e] [g/hp-hr]	Emission Factor [lb/hp-hr]	Emission Factor Source	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Firewater Pump Engine - (P) FWP-1							
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.12	0.12	0.01
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.004	0.004	0.0002
CO	3.5	2.61	0.01	NSPS 4I	2.01	2.01	0.10
NMHC + NOx	4	-	-	NSPS 4I	-	-	-
NO_x	3.7	2.74	0.01	NSPS 4I	2.12	2.12	0.11
Total VOC	0.3	0.24	0.001	NSPS 4I	0.18	0.18	0.01

[d] **350 Hp Firewater Pump Engine:**
NMHC + NOx, CO, and PM taken from 40 CFR 60, Subpart IIII, Table 4 [225<=kW<450 (300<=Hp<600)]; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NO_x factor used for VOC and NO_x by assuming 92% NO_x and 8% VOC, based on the ratios of NO_x and VOC AP-42 emission factors.

[e] 1 kW = 1.341 hp

Greenhouse Gas Emission Factors

Pollutant	Global Warming Potential[f]	Emission Factor[g] (kg/MMBtu)
CO_2	1	73.96
CH_4	25	3.0E-03
N_2O	298	6.0E-04
CO_2e	-	-

[f] Default global warming potentials from 40 CFR 98 Subpart A, Table A-1.

[g] Default emission factors from 40 CFR 98 Subpart C, Tables C-1 and C-2, for diesel.

Greenhouse Gas Emissions Summary

EPN	CO_2			CH_4			N_2O			CO_2e		
	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)	(metric tpy)[h]	(short tpy)[i]	(lb/hr)
(P) FWP-1	18	20	399	0.02	0.02	0.4	0.04	0.05	1	18	20	401

[h] Calculated by using 40 CFR 98 Subpart C Equation C-1b.

[i] Calculated by multiplying metric tons per year by 1.10231 short tons/metric ton, as per 40 CFR 98 Subpart A, Table A-2.

Texas GulfLink, LLC
Offshore Platform
Pigging Operations

EPN	Description
(P) P-1	MSS - Pigging Operations

The chambers for the inlet gas and residue gas receivers were estimated as shown below.

	Gas Line Receiver	
Receiver diameter	54	in
Receiver length	38	ft
Pipeline Pressure	1	psig
Receiver volume	604.36	cu ft
Gas volume	645.48	SCF
Duration of releases	0.50	hr
Releases per year	12	# per yr
VMW of Crude from TANKS 4.09d:	50.00	lb/lbmol
	385.30	scf/lbmol
	1.68	lbmol
	83.76	lbs VOC per event
	1,005.16	lbs VOC per year

From TANKS 4.09d:

NAME	V_WT_FRACT
Hexane (-n)	0.022831039
Benzene	0.004411371
Isooctane	0.000379612
Toluene	0.002159389
Ethylbenzene	0.00029583
Xylene (-m)	0.000865592
Isopropyl benzene	3.37653E-05

0.50	tons VOC per year
0.01147	tons/yr n-Hexane
0.00222	tons/yr Benzene
0.00019	tons/yr Isooctane
0.00109	tons/yr Toluene
0.00015	tons/yr Ethylbenzene
0.00044	tons/yr Xylene
0.00002	tons/yr Cumene
83.76	lbs VOC per hr
1.91	lbs/hr n-Hexane
0.37	lbs/hr Benzene
0.03	lbs/hr Isooctane
0.18	lbs/hr Toluene
0.02	lbs/hr Ethylbenzene
0.07	lbs/hr Xylene
0.003	lbs/hr Cumene

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol):	34.1
Average Concentration of H_2S in Crude (ppmv):	5
Molecular Weight of Crude (lb/lbmol):	50
Average TVP of Crude (psia):	8.98

Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	6.41E-07	6.41E-07	2.81E-06

Texas GulfLink, LLC
Offshore Platform
Platform Fugitive Emissions

EPN	Description
(P) F-1	Platform Fugitive Emissions

Given:

Component Type	Service	Component Count
valves	Light liquid (LL)	163
pump seals	Light liquid (LL)	4
flanges	Light liquid (LL)	378

The number of flanges is assumed to be twice that of valves.

Calculation Methodology:
VOC Average Hourly Rate [lb/hr] = TCEQ Emission Factor [lb/hr/component] x Component Count
VOC TAP Speciate Hourly Rate [lb/hr] = Liquid Mass Fraction x Total VOC Average Hourly Rate [lb/hr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Average Hourly Rate [lb/hr] / Conversion Factor [2000 lb/ton] x Annual Operating Hours

Reference:
Air Permit Technical Guidance for Chemical Sources - Fugitive Guidance, APDG 6422, Air Permits Division TCEQ, June 2018, Table II

Emission Calculation:

Component Type	Light Liquid Emission Factor [lb/hr/component]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
valves	0.0000948	0.02	0.02	0.07
pump seals	0.00119	0.005	0.005	0.02
flanges	0.00001762	0.01	0.01	0.03
	Total VOC	**0.03**	**0.03**	**0.12**

VOC TAP Speciation	Liquid Mass Fraction[(1)]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Benzene	0.006	0.0002	0.0002	0.0007
Ethylbenzene	0.004	0.00011	0.00011	0.0005
n-Hexane	0.019	0.00052	0.00052	0.0023
Toluene	0.010	0.0003	0.0003	0.0012
Xylenes	0.014	0.0004	0.0004	0.002
Cumene (Isopropyl benzene)	0.001	0.00003	0.00003	0.00012
Iso-octane	0.001	0.00003	0.00003	0.00012

Notes:
(1) VOC TAP Speciation Profile from TANKS 4.09d for Crude Oil.

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol):	34.1
Average Concentration of H_2S in Crude (ppmv):	5
Molecular Weight of Crude (lb/lbmol):	50
Average TVP of Crude (psia):	8.98

Average Concentration of H_2S in Crude is an assumption.

Pollutant	**Average Hourly Rate [lb/hr]**	**Max Hourly Rate [lb/hr]**	**Annual Emission Rate [tpy]**
Hydrogen Sulfide	1.50E-07	1.50E-07	6.57E-07

Texas GulfLink, LLC
Offshore Platform
SPM System Fugitives

EPN	Description
(P) F-2	SPM System Fugitives

Maximum w/ Contingency (days per year) 365 days
24 hr/day

Emission Calculations

Component Type	Total Number of Components [1]	Oil & Gas Emission Factor	Fugitive Emission Factor [2]	Total Organic Compound	Total Organic Compound	Total Organic Compound	Total Organic Compound
		(lb/hr)	(lb/hr/component)	Average lbs/hr	Maximum lbs/hr	lbs/day	tons/project
Valves	16	Light Liquid (Light Oil> 20° API)	5.50E-03	8.80E-02	8.80E-02	2.11	0.39
Flanges	52	Light Liquid (Light Oil> 20° API)	2.43E-04	1.26E-02	1.26E-02	0.30	0.06
	Total TOC [4] - Heavy Oil Streams			**0.10**	**0.10**	**2.42**	**0.44**

[1] Component counts are based on engineering design information provided by Abadie-Williams LLC.
[2] Emission Factors were obtained from *Table 4. Average Emission Factors - Petroleum Industry* (Oil & Gas Production Operations) of TCEQ's Addendum to RG-360A, Emission Factors for Equipment Leak Fugitives Components, January 2008.
[3] Fugitive emissions are conservatively estimated to be 100% VOC.
[4] Annual operating hours are conservatively assumed to be 8,760 hours per year.

Texas GulfLink, LLC
Offshore Platform
Miscellaneous Emissions

EPN	Description
(P) S-1	Sampling Activities
(P) PM-1	MSS - Pump Maintenance

Sampling Activities

Emissions from sampling activities are estimated based on the following:

Quantity	Units
1	sample/shift
3	shifts/day
0.1	lb VOC/sample
0.1	lb VOC/hr
0.05	ton VOC/yr

MSS - Pump Maintenance

Emissions from pump maintenance are estimated based on the following:

Quantity	Units
4	pumps
1	maintenance event/yr
1	lb/maintenance event
4	lb VOC/hr
0.002	ton VOC/yr

MSS Emissions Associated with Abrasive Blasting and Painting

Company Name	Texas GulfLink, LLC
Site Name	Offshore Platform

Source Name	MSS - Abrasive Blasting / Painting
EPN	(P) MSS-1

1. Input variables such as amount of paint used (gallons) or number of hours blasting operation occurs in the yellow box. 2. Default numbers are included for your convenience but may be edited

#	Activity	Description / comments	Default parameters		Input parameters		Annual emissions (tpy)
1	***(b)(2) Aerosol Cans*** Includes spray paints and primers, degreasers, cleaners and other solvents, rust inhibitors	- 90% VOC content is an average obtained from a survey of MSDS sheets (c)(d)(e) for spray paints and primers, degreasers, cleaners and other solvents, rust inhibitors. This does not include lubricants. -VOC is propellant. 100% VOC evaporates.	Standard Industrial Size Cans (oz.)	16	Number of 16 oz cans used	100	0.045 VOC (tpy)
			VOC emissions (lb/can)	0.9			
2	***(b)(2) Manual application of paints, primer*** Touch up paint	-100% VOC evaporates - Survey of MSDS sheets (a) (b) indicates VOC content varies from 2 lb/gallon to 7 lb/gallon. As Chapter 115 limits VOC content to 3.5 lb/gal in nonattainment areas this was used as a conservative amount -Usage of paint based on technical expertise and NSR permit section reviews.	VOC content (lb/gal)	3.5	Paint used (gallons)	25	0.044 VOC (tpy)
3	***(b)(2) Painting Tanks and Other Immovable Fixed Structures*** Spray Painting	-100% VOC evaporates -Painting used on 1 tank or 1 vessel per year - Survey of MSDS sheets (a)(b) indicates VOC content varies from 2 lb/gallon to 7 lb/gallon. As Chapter 115 limits VOC content to 3.5 lb/gal in nonattainment areas this was used as a conservative amount. -Input parameters based on TCEQ Surface Coating Guidance Document for Air Quality Permit Applications. -Per field research in 2012, company indicated that a large site uses around 100 gallons to paint pipes and tanks in 6 month period.	VOC content (lb/gal)	3.5	Paint used (gallons)	100	0.175 VOC (tpy)
			$PM_{10\ \&\ 2.5}$ content (lb/gal)	8			
			Transfer Efficiency $PM_{10\ \&\ 2.5}$ (%)	65			0.008 PM_{10} (tpy)
			Droplet factor for $PM_{2.5}$ overspray (%)	99			
			Droplet factor for PM_{10} overspray (%)	94			0.001 $PM_{2.5}$ (tpy)
4	***(b)(2) Sandblasting***	-An application rate of 2,000 lb/hr. -Per industry expertise and BMP, blasting occurs for 5 days per year and 8 hrs per day -Emission factors for PM10 based on TCEQ Abrasive Blast Cleaning technical guidance document. Emission factor for PM2.5 is based on 15% of PM10 emission factor.	Emission factor for PM_{10} (lb/lb of usage)	0.0014	Number of hours blasting operation occurs	40	0.056 PM_{10} (tpy)
			Application rate (lb/hr)	2000			
			PM_{10} Emissions (lb/hr)	2.8			
			Emission factor for $PM_{2.5}$ (lb/lb of usage)	0.00021			0.0084 $PM_{2.5}$ (tpy)
			Application rate (lb/hr)	2000			
			$PM_{2.5}$ Emissions (lb/hr)	0.42			

	TPY	lbs/hr
Total VOC emissions	**0.26**	**0.06**
Total PM_{10} emissions	**0.06**	**0.01**
Total $PM_{2.5}$ emissions	**0.01**	**0.002**

Texas GulfLink, LLC
Offshore Service Vessel (OSV)
Gas Turbine Electric Generators

Two 1,800 KW gas turbine generators are used to supply electricity to the OSV.

EPN	Description	Op Hours Firing LVOC	Op Hours Firing SVOC	Firing Rate LVOC (MMBtu/yr)	Firing Rate SVOC (MMBtu/yr)
(OSV) GT-1	GT Generator 1	4,692.0	4,554.0	65,990	43,758
(OSV) GT-2	GT Generator 2	4,692.0	4,554.0	65,990	43,758

Given:

Power Output of Each Generator	1800	KW[1]
Power Output of Each Turbine	3,600	Hp[2]
Power Output of Each Turbine	2,685	KW[3]

	Gas Turbine Generator 1				Gas Turbine Generator 2			
Load (%)	**30**	**40**	**50**	**90**	**30**	**40**	**50**	**90**
Hours/Month	0.0	11.5	0.0	379.5		11.5		379.5
Hours/Year	0.0	138.0	0.0	4,554.0		138.0		4,554.0
Fuel Flow (kg/s) - LVOC	0.094	0.103	0.111	0.089		0.103		0.089
Exhaust Gas Flow (kg/s) - LVOC	9.0	9.0	9.0	9.0		9.0		9.0
LHV (MJ/kg) - LVOC	46.2	46.2	46.2	46.2		46.2		46.2
Firing Rate (MJ/s) - LVOC	4.34	4.76	5.13	4.10		4.76		4.10
Firing Rate (MMBtu/hr) - LVOC[4]	14.82	16.24	17.50	14.00		16.24		14.00
Exhaust Gas Flow (kg/s) - SVOC	9.1	9.1	9.1	9.2		9.1		9.2
Fuel Flow (kg/s) - SVOC				0.141				0.141
LHV (MJ/kg) - SVOC				20.0				20.0
Firing Rate (MJ/s) - SVOC				2.82				2.82
Firing Rate (MMBtu/hr) - SVOC[4]				9.61				9.61

Criteria Emissions

Pollutant	LVOC Emission Factors	Source	SVOC Emission Factors	Source
PM_{10} (lb/hr)	0.25	Manufacturer	0.25	Manufacturer
$PM_{2.5}$ (lb/hr)	0.25	Manufacturer	0.25	Manufacturer
SO_2 (Lb/MMBtu)	0.0034	AP-42, Table 3.1-2a	0.0034	AP-42, Table 3.1-2a
NOx (ppmv)	40	Manufacturer	40	Manufacturer
CO (ppmv)	50	Manufacturer	50	Manufacturer
VOC (ppmv)	5	Manufacturer	5	Manufacturer

40 CFR 60 App A-7, Method 19 - flue gas flow (15% O_2) =	30,854	dscf/MMBtu
MW NOx (as NO_2) =	46	lb/lb-mole
MW CO =	28	lb/lb-mole
MW VOC (as propane C3H8) =	44	lb/lb-mole
Molal volume of ideal gas =	385.3	scf/lb-mole (68F, 1

NOx factor =	0.147	lb/MMBtu
CO factor =	0.112	lb/MMBtu
VOC factor =	0.018	lb/MMBtu

Pollutant	Gas Turbine Generator 1 Max Hourly (Lb/Hr)	Gas Turbine Generator 1 Annual (TPY)	Gas Turbine Generator 2 Max Hourly (Lb/Hr)	Gas Turbine Generator 2 Annual (TPY)
PM_{10}	0.30	1.31	0.30	1.31
$PM_{2.5}$	0.30	1.31	0.30	1.31
SO_2	0.25	0.19	0.14	0.19
NOx	3.48	8.16	3.48	8.16
CO	2.65	6.21	2.65	6.21
VOC	0.42	0.98	0.42	0.98

Emission rates for NOx, CO, and VOC based on L-VOC firing only, and at max Firing Rate (L-VOC + S-VOC)

Example Calculation - same method for NOx, CO and VOC

$E.R._i$ (lb/hr) = $Factor_i$ (lb/MMBtu) x F.R. (MMBtu/hr) = ($ppmv_i$/1E06 x MWi x flue gas flowrate / molal volume) x F.R. (MMBtu/hr)

For NOx: E.R. (lb/hr) = [350/1E06 x 46.01 x 10,170 / 385.3] x (14.0 + 9.61) = 3.48 lb/hr NOx

E.R. (tpy) = 10.03 lb/hr x 4,692 hr/yr / 2,000 lb/ton = 8.16 tpy NOx

Greenhouse Gas Emissions

Pollutant		Natural Gas Emission Factor[5] (kg/MMBtu)	Global Warming Potentials[6]	Gas Turbine Generator 1				Gas Turbine Generator 2			
				Average[7] (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e[8] (tonnes/yr)	Average[7] (lb/hr)	Maximum (lb/hr)	Annual (tpy)	CO_2e[8] (tonnes/yr)
CO_2		53.06	1	1,645.2	1,645.2	3,859.7	3,502.4	1,645.2	1,645.2	3,859.7	3,502.4
CH_4		1.00E-03	25	0.03	0.03	0.07	0.07	0.03	0.03	0.07	0.07
N_2O		1.00E-04	298	0.003	0.003	0.01	0.01	0.003	0.003	0.01	0.01
CO_2e		--	--	1,645.2	1,645.2	3,859.7	3,502.5	1,645.2	1,645.2	3,859.7	3,502.5

Hazardous Air Pollutant Emission Calculation:

Hazardous Air Pollutant	Emission Factor[9] [lb/MMBtu]		Emission Factor Source	Gas Turbine Generator 1			Gas Turbine Generator 2		
				Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)	Average (lb/hr)	Maximum (lb/hr)	Annual (tpy)
1,3-Butadiene	4.30E-07	-	AP-42, Ch. 3.1	5.28E-06	3.10E-05	2.31E-05	5.28E-06	3.10E-05	2.31E-05
Acetaldehyde	4.00E-05	-	AP-42, Ch. 3.1	4.91E-04	2.89E-03	2.15E-03	4.91E-04	2.89E-03	2.15E-03
Acrolien	6.40E-06	-	AP-42, Ch. 3.1	7.85E-05	4.62E-04	3.44E-04	7.85E-05	4.62E-04	3.44E-04
Benzene	1.20E-05	-	AP-42, Ch. 3.1	1.47E-04	8.66E-04	6.45E-04	1.47E-04	8.66E-04	6.45E-04
Ethylbenzene	3.20E-05	-	AP-42, Ch. 3.1	3.93E-04	2.31E-03	1.72E-03	3.93E-04	2.31E-03	1.72E-03
Formaldehyde	7.10E-04	-	AP-42, Ch. 3.1	8.71E-03	5.12E-02	3.82E-02	8.71E-03	5.12E-02	3.82E-02
Naphthalene	1.30E-06	-	AP-42, Ch. 3.1	1.60E-05	9.38E-05	6.99E-05	1.60E-05	9.38E-05	6.99E-05
PAH	2.20E-06	-	AP-42, Ch. 3.1	2.70E-05	1.59E-04	1.18E-04	2.70E-05	1.59E-04	1.18E-04
Propylene Oxide	2.90E-05	-	AP-42, Ch. 3.1	3.56E-04	2.09E-03	1.56E-03	3.56E-04	2.09E-03	1.56E-03
Toluene	1.30E-04	-	AP-42, Ch. 3.1	1.60E-03	9.38E-03	6.99E-03	1.60E-03	9.38E-03	6.99E-03
Xylene	6.40E-05	-	AP-42, Ch. 3.1	7.85E-04	4.62E-03	3.44E-03	7.85E-04	4.62E-03	3.44E-03

Notes:

(1) Taken from https://www.opraturbines.com/gas-turbine/

(2) Taken from https://www.electricgeneratorsdirect.com/stories/22-How-to-Pick-the-Perfect-Power-Take-Off-Generator.html, "The rule of thumb is that you need 2 HP to produce 1 kW of electricity."

(3) 1.341 hp/Kw

(4) 0.00094782 MMBtu/MJ

(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98.

(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

(7) Emissions converted from kg to lbs using 2.20462 lb/kg.

(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

(9) AP-42, Sec 3.1, Table 3.1-3

OSV time allocation at Deepwater Port - Monthly			Power to Buss			
			Hours	GT	GT	Functions
VLCC's per month		**11.5**		1789	1789	
				Power percentage		
Loading hours	33	**379.5**	33	90	90	DP, Hotel, VR
Hose set-up SPM	1		1	33	33	Engine, DP, Hotel
Mooring Ops	4		4	33	33	Engine, DP, Hotel
Cargo Hoses	1		1	33	33	Engine, DP, Hotel
Vapor Hose	1		1	33	33	Engine, DP, Hotel
DOI/Line-up	1		1	33	33	Engine, DP, Hotel
loading cargo						
Cargo Hoses	1		1	33	33	Engine, Hotel
Vapor Hose	1		1	33	33	Engine, Hotel
unmooring	1		1	33	33	Engine, Hotel
Mooring & Hoses Total	10	**115**				
in-bound Freeport	2.8		1	90	90	Engine, Hotel
docking/port passage	1		1	38	38	Engine, Hotel
dock activities	12		1	46	0	Pumps, Hotel
undocking/port passage	1		1	38	38	Engine, Hotel
out-bound transit	2.8		1	90	90	Engine, Hotel
Total offload trip	19.6	**117.6**				
Port Congestion		**6**	1	24	0	Hotel
shore fog delay		6	1	24	0	Hotel
offshore fog	8					
seas> 10 ft	40					
no vr seas	6					
Weather Delays		**54**	1	24	0	Hotel
Repairs/Insp/stores		**12**	1	30	0	Hotel, Misc
Maintenance		**24**	1	30	0	Hotel. Misc
Misc Idle time at Deepwater Port		6	1	24	0	Hotel
Monthly Total hours		**720.1**				

Performance data for LVOC fuel (LHV=46.2 MJ/kg) as a function of load. Tamb=15C.

Load	[%]	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Electrical Power	[kW]	0	166	332	498	664	830	996	1162	1328	1494	1660
Electrical efficiency	[%]	0.0%	4.8%	8.5%	11.4%	13.8%	16.1%	18.0%	19.4%	20.7%	21.7%	22.7%
Exhaust Gas Temperature	**[degC]**	322	348	369	394	419	438	462	490	518	546	574
Fuel flow	**[kg/s]**	0.062	0.074	0.084	0.094	0.103	0.111	0.119	0.129	0.138	0.148	0.157
Exhaust Gas Flow	**[kg/s]**	8.9	8.9	8.9	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0

Performance data for LVOC fuel (LHV=46.2 MJ/kg) as a function of ambient temperature

Engine inlet temperature	[degC]	**-20**	**-10**	**0**	**10**	**15**	**20**	**30**	**40**
Electrical Power	[kW]	2161	2016	1868	1726	1660	1575	1422	1295
Electrical efficiency	[%]	25.2%	24.5%	23.8%	23.1%	22.7%	22.1%	20.9%	19.8%
Exhaust Gas Temperature	**[degC]**	549	557	563	570	574	578	587	598
Fuel flow	**[kg/s]**	0.185	0.177	0.168	0.161	0.157	0.153	0.146	0.141
Exhaust Gas Flow	**[kg/s]**	10.1	9.9	9.5	9.1	9.0	8.8	8.4	8.0

Performance data for surplus gas fuel SVOC (LHV=20 MJ/kg) as a function of load. Tamb=15C.

Load	[%]	**0**	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Electrical Power	[kW]	0	162	324	486	647	809	971	1133	1295	1456	1618
Electrical efficiency	[%]	0.0%	4.5%	8.0%	10.7%	13.1%	15.3%	16.9%	18.3%	19.6%	20.7%	21.6%
Exhaust Gas Temperature	**[degC]**	334	360	381	407	430	448	476	503	530	556	582
Fuel flow	**[kg/s]**	0.151	0.179	0.202	0.226	0.247	0.265	0.287	0.309	0.330	0.352	0.374
Exhaust Gas Flow	**[kg/s]**	9.0	9.0	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.2	9.2

Performance data for surplus gas fuel SVOC (LHV=20 MJ/kg) as a function of ambient temperature

Engine inlet temperature	[degC]	**-20**	**-10**	**0**	**10**	**15**	**20**	**30**	**40**
Electrical Power	[kW]	2113	1967	1823	1683	1618	1534	1383	1260
Electrical efficiency	[%]	24.1%	23.4%	22.8%	22.0%	21.6%	21.0%	19.9%	18.8%
Exhaust Gas Temperature	**[degC]**	557	564	571	578	582	586	595	605
Fuel flow	**[kg/s]**	0.438	0.421	0.400	0.382	0.374	0.364	0.347	0.334
Exhaust Gas Flow	**[kg/s]**	10.4	10.1	9.7	9.3	9.2	9.0	8.6	8.2

Texas GulfLink, LLC
Offshore Service Vessel (OSV)
OSV Diesel Generators

Two (2) 1,800 KW generators are used to supply electricity to the OSV.
Supplemental power is sourced, when needed, from four diesel engines. Hours of use assume pumping at maximum rate 25% of cycle, during this time additional power demand requires use of second diesel engine (CAT 3512C-No. 1). During normal pumping (75% of cycle), conservatively assuming that one of the larger two engines (CAT 3516C-No. 1) is used.

EPN	Description[(1)]	Power Output of Engine KW[(1)]	Power Output of Engine Hp[(1)]	Firing Rate[(3)] (MMBtu/hr)	Load during Loading	Operating Hours
(OSV) EDG-1	CAT 3516C - No. 1	2,000	2,100	14.70	90%	4,692
(OSV) EDG-2	CAT 3516C - No. 2	2,000	2,100	14.70	71%	0
(OSV) EDG-3	CAT 3512C - No. 1	1,700	1,500	10.50	71%	1,173
(OSV) EDG-4	CAT 3512C - No. 2	1,700	1,500	10.50	71%	0

Calculation Methodology:
Average Hourly Rate [lb/hr] = Annual Emission Rate [tpy] x Conversion Factor [2000 lbs/ton] / Operating Hours [hrs/yr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Power Output [hp] x Operating Hours x Emission Factor [lb/hp-hr] / Conversion Factor [2000 lbs/1 ton]

Criteria Emission Calculation:

					CAT 3516C - No. 1			CAT 3512C - No. 1		
Pollutant	**Emission Factor[(4)]** [g/kW-hr]	**Emission Factor[(2)]** [g/hp-hr]	**Emission Factor [lb/hp-hr]**	**Emission Factor Source**	**Average Hourly Rate [lb/hr]**	**Max Hourly Rate [lb/hr]**	**Annual Emission Rate [tpy]**	**Average Hourly Rate [lb/hr]**	**Max Hourly Rate [lb/hr]**	**Annual Emission Rate [tpy]**
PM_{10}	0.2	0.15	0.0003	NSPS 4I	0.33	0.33	1.46	0.05	0.05	0.21
$PM_{2.5}$	0.2	0.15	0.0003	NSPS 4I	0.33	0.33	1.46	0.05	0.05	0.21
SO_2	-	-	0.00001	AP-42, Ch. 3.4 15 ppm	0.01	0.01	0.05	0.00	0.00	0.01
CO	3.5	2.61	0.01	NSPS 4I	5.82	5.82	25.51	0.82	0.82	3.59
NMHC + NOx	6.40	-	-	NSPS 4I	-	-	-	-	-	-
NO_x	6.23	4.65	0.01	NSPS 4I	10.37	10.37	45.44	1.46	1.46	6.40
Total VOC	0.17	0.12	0.0003	NSPS 4I	0.28	0.28	1.21	0.04	0.04	0.17

Greenhouse Gases Emission Calculation:

Pollutant	Emission Factor[5] (kg/MMBtu)	Global Warming Potentials[6]	CAT 3516C - No. 1 Average[7] (lb/hr)	CAT 3516C - No. 1 Maximum (lb/hr)	CAT 3516C - No. 1 Annual (tpy)	CAT 3516C - No. 1 CO_2e[8] (tonnes/yr)	CAT 3512C - No. 1 Average[7] (lb/hr)	CAT 3512C - No. 1 Maximum (lb/hr)	CAT 3512C - No. 1 Annual (tpy)	CAT 3512C - No. 1 CO_2e[8] (tonnes/yr)
CO_2	73.96	1	2,397	2,397	5,623	5,103	1,712	1,712	1,004	911
CH_4	3.00E-03	25	0.1	0.1	5.7	5.2	0.1	0.1	4.1	0.9
N_2O	6.00E-04	298	0.02	0.02	14	12.3	0.01	0.01	10	2.2
CO_2e	--	--	2,397	2,397	5,642	5,120	1,712	1,712	1,018	914

Toxic Air Pollutant Emission Calculation:

Pollutant	Emission Factor [lb/MMBtu]	Emission Factor Source	CAT 3516C - No. 1 Average Hourly Rate [lb/hr]	CAT 3516C - No. 1 Max Hourly Rate [lb/hr]	CAT 3516C - No. 1 Annual Emission Rate [tpy]	CAT 3512C - No. 1 Average Hourly Rate [lb/hr]	CAT 3512C - No. 1 Max Hourly Rate [lb/hr]	CAT 3512C - No. 1 Annual Emission Rate [tpy]
Acetaldehyde	0.0000252	AP-42, Ch. 3.4	0.0002	0.0002	0.001	0.00003	0.00003	0.0001
Benzene	0.000776	AP-42, Ch. 3.4	0.005	0.005	0.024	0.001	0.001	0.003
Formaldehyde	0.0000789	AP-42, Ch. 3.4	0.001	0.001	0.002	0.0001	0.0001	0.0003
Toluene	0.000281	AP-42, Ch. 3.4	0.002	0.002	0.009	0.0003	0.0003	0.001
Xylene	0.000193	AP-42, Ch. 3.4	0.001	0.001	0.006	0.0002	0.0002	0.001

Notes:

(1) Generator Model Numbers and KW provided by Abadie. HP taken from Caterpillar website is Max Hp for that Model Number.

(2) 1.341 hp/Kw

(3) Converted using 7,000 Btu/hp-hr from AP-42, Chapter 3.

(4) NMHC + NO_x, CO, and PM taken from 40 CFR 89.112(a) Table 1; PM factor used for PM_{10} and $PM_{2.5}$; NMHC + NO_x factor used for VOC and NOx by assuming 97% NO_x and 3% VOC, based on the ratios of NO_x and VOC AP-42 emission factors in Chapter 3.4.

(5) All emission factors taken from Tables C-1 and C-2 to Subpart C of Part 98. Distillate Fuel Oil No. 2 for CO_2 emission factor, Petroleum (all fuel type in Table C-1) for CH_4 and N_2O emission factors.

(6) Global warming potentials for converting to CO_2e taken from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

(7) Emissions converted from kg to lbs using 2.20462 lb/kg.

(8) CO_2e tonnes calculated using 2,204 lbs/tonne and global warming potentials from Table A-1 to Subpart A of Part 98 - Global Warming Potentials.

Texas GulfLink, LLC
Offshore Service Vessel (OSV)
OSV Fugitive Emissions

EPN	Description
(OSV) F-1	OSV Fugitive Emissions

Given:

Component Type	Service	Component Count
Valves	Light liquid (LL)	52
Pump seals	Light liquid (LL)	0
Flanges	Light liquid (LL)	141
Valves	G/V	143
Pump seals	G/V	0
Flanges	G/V	455
Other	-	3

Reference:
Air Permit Technical Guidance for Chemical Sources - Fugitive Guidance, APDG 6422, Air Permits Division TCEQ, June 2018, Table II
Gas/vapor "flange" and "other" emission factors not available in Table II; therefore, applied the gas/vapor valve emission factor to be conservative.

Calculation Methodology:
VOC Average Hourly Rate [lb/hr] = TCEQ Emission Factor [lb/hr/component] x Component Count
VOC TAP Speciated Hourly Rate [lb/hr] = Liquid Mass Fraction x Total VOC Average Hourly Rate [lb/hr]
Max Hourly Rate [lb/hr] = Average Hourly Rate [lb/hr]
Annual Emission Rate [tpy] = Average Hourly Rate [lb/hr] / Conversion Factor [2000 lb/ton] x Annual Operating Hours

Emission Calculation: used "Petroleum Markting Terminal" emission factors (TCEQ guidance)

Component Type	Gas/Vapor Factor [lb/hr/component]	Light Liquid Factor [lb/hr/component]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Valves	0.0000287	0.0000948	0.01	0.01	0.04
Pump seals		0.00119	0.E+00	0.E+00	0.E+00
Flanges	0.0000287	0.00001762	0.02	0.02	0.07
Other	0.0000287		0.0001	0.0001	0.0004
		Total VOC	**0.02**	**0.02**	**0.11**

VOC TAP Speciation	Liquid Mass Fraction[(1)]	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Benzene	0.006	0.0001	0.0001	0.0006
Ethylbenzene	0.004	0.00010	0.00010	0.0004
n-Hexane	0.019	0.00048	0.00048	0.0021
Toluene	0.010	0.0002	0.0002	0.0011
Xylenes	0.014	0.0003	0.0003	0.002
Cumene (Isopropyl benzene)	0.001	0.00002	0.00002	0.00011
Iso-octane	0.001	0.00002	0.00002	0.00011

Notes:
(1) VOC TAP Speciation Profile from TANKS 4.09d for Crude Oil.

Hydrogen Sulfide Emissions:

Molecular Weight of H_2S (lb/lbmol):	34.1
Average Concentration of H_2S in Crude (ppmv):	5
Molecular Weight of Crude (lb/lbmol):	50
Average TVP of Crude (psia):	8.98

Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	1.38E-07	1.38E-07	6.03E-07

Texas GulfLink, LLC
Offshore Service Vessel (OSV)
OSV Fugitive Emissions - Hose Disconnects

EPN	Description
(OSV) F-2	VRV Fugitive Emissions - Hose Disconnects

Hose disconnected after each VLCC load. Hose is 250' in length with a 16" diameter.

Hose diameter	16	in	
Hose length	2	ft	(spool piece)
Hose pressure	1	psig	
Hose volume	2.79	cu ft	
Gas volume	2.98	SCF	
Releases per year	180		

VMW of Crude from TANKS 4.09d:	50.00	lb/lbmol
	385.30	scf/lbmol
	0.01	lbmol
	0.39	lbs VOC per event
	69.67	lbs VOC per year

From TANKS 4.09d:

NAME	V_WT_FRACT
Hexane (-n)	0.022831039
Benzene	0.004411371
Isooctane	0.000379612
Toluene	0.002159389
Ethylbenzene	0.00029583
Xylene (-m)	0.000865592
Isopropyl benzene	3.37653E-05

0.03	tons VOC per year
0.001	tons/yr n-Hexane
0.0002	tons/yr Benzene
0.00001	tons/yr Isooctane
0.0001	tons/yr Toluene
0.00001	tons/yr Ethylbenzene
0.00003	tons/yr Xylene
0.000001	tons/yr Cumene

0.39	lbs VOC per hr
0.01	lbs/hr n-Hexane
0.002	lbs/hr Benzene
0.0001	lbs/hr Isooctane
0.001	lbs/hr Toluene
0.0001	lbs/hr Ethylbenzene
0.0003	lbs/hr Xylene
0.00001	lbs/hr Cumene

Hydrogen Sulfide Emissions:

Molecular Weight of H2S (lb/lbmol):	34.1
Average Concentration of H_2S in Crude (ppmv):	5
Molecular Weight of Crude (lb/lbmol):	50
Average TVP of Crude (psia):	8.98

Average Concentration of H_2S in Crude is an assumption.

Pollutant	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
Hydrogen Sulfide	4.44E-08	4.44E-08	1.94E-07

Texas GulfLink, LLC
Offshore Service Vessel (OSV)
Uncontrolled Marine Loading (Bad Weather)

EPN	Description
(OSV) UM -1	Uncontrolled Marine Loading/ Poor Weather/ Safety First

This calculation takes into account emissions from uncontrolled loading in the event that there is bad weather and therefore, the OSV must vacate the area.
It is estimated that this may occur three times per year for six hours per event. Whereas, loading under normal conditions is based on a max load rate of 85,000 bph, this bad weather calculation assumes 65,000 bph.

3	**Events/Yr**
6	**Hours/Event**

AP-42, Chapter 5, Section 5.2
Transportation and Marketing of Petroleum Liquids
Equation 2 was developed specifically for estimating emissions from the loading of crude oil into ships and ocean barges.

$C_L = C_A + C_G$
C_L = total loading loss (lb/10^3 gal of crude oil loaded)

C_A = arrival emission factor (lb/10^3 gal loaded)

C_A =	0.86	Taken from Table 5.2-3, based on "Uncleaned" and "Volatile", assumes no ballasting.	
		Vapor pressure is > 1.5 psia.	

C_G = generated emission factor (lb/10^3 gal loaded)
Equation 3: C_G = 1.84*(0.44P-0.42)*((MG)/T)

P =	8.98	psia	Average true vapor pressure for Crude Oil estimated using TANKS 4.09d and information provided by Abadie-Williams LLC.	
P =	10.00	psia	Maximum true vapor pressure for Crude Oil estimated using AP-42, Figure 7.1-13 and information provided by Abadie-Williams LLC.	Based on 80 deg F and RVP10.
M =	50	lb/lb-mol	VMW of loaded crude	
G =	1.02	dimensionless	AP-42	
T =	529.67	deg R	Average temperature of loaded crude provided by Abadie-Williams LLC.	
T =	539.67	deg R	Maximum temperature of loaded crude provided by Abadie-Williams LLC.	
C_G =	0.63	**ANNUAL EMISSION FACTOR**		
C_G =	0.69	**MAXIMUM EMISSION FACTOR**		

ANNUAL

C_L =	1.49	lb TOC/10^3 gal loaded	1.26	lb VOC/10^3 gal loaded

MAXIMUM

C_L =	1.55	lb TOC/10^3 gal loaded	1.32	lb VOC/10^3 gal loaded

Per Chapter 5, emission factors derived from Equation 3 and Table 5.2-3 represent TOC. When specific vapor composition information is not available, the VOC emission factor can be estimated by taking 85% of the TOC factor.

Pollutant	Maximum Emission Factor (lb/10^3 gal)	Annual Emission Factor (lb/10^3 gal)	Maximum Crude Loading Rate (bbl/hr)	Annual Crude Loaded (bbl/yr)	MW (lb/lbmol)	Average Concentration of H_2S in Crude (ppmv)	Maximum Concentration of H_2S in Crude (ppmv)	Average Hourly Rate [lb/hr]	Max Hourly Rate [lb/hr]	Annual Emission Rate [tpy]
VOC	1.32	1.26	65,000	1,170,000	-	-	-	3,447.37	3,601.55	31.03
Benzene	-	-	-	-	-	-	-	15.21	15.89	0.14
Ethylbenzene	-	-	-	-	-	-	-	1.02	1.07	0.01
n-Hexane	-	-	-	-	-	-	-	78.71	82.23	0.71
Isooctane	-	-	-	-	-	-	-	1.31	1.37	0.01
Isopropyl benzene	-	-	-	-	-	-	-	0.12	0.12	0.001
Toluene	-	-	-	-	-	-	-	7.44	7.78	0.07
Xylene	-	-	-	-	-	-	-	2.98	3.12	0.03
H_2S	-	-	-	-	34.1	5	25	0.00004	0.09	0.0002

Annual Crude Loading Rate provided by Abadie-Williams LLC.

Maximum Crude Loading Rate provided by Abadie-Williams LLC.

Maximum and Annual Concentration of H_2S in Crude is an assumption.

	Tanks 4.09d (rev)	WTI S/T 6008	WTI - Pecos River	WTI - Houston	Bakken 2016
HAP	**Wt Frac**	**Wt Frac**	**Wt Frac**	**Wt Frac**	**Wt Frac**
Benzene	0.0044	0.00398	0.00444	0.00256	0.0017
Ethylbenzene	0.0003	0.0025			
Hexane (-n)	0.0228	0.01507	0.01932	0.01481	
Isooctane	0.0004	0.01748			
Isopropyl benzene	0.0000				
Toluene	0.0022	0.00831			0.0067
Xylene (-m)	0.0009	0.00672			
Unidentified Components	0.9637	0.93483			
Cyclohexane	0.0053	0.01111			
1,2,4-Trimethylbenzene	0.0000				
Sum Wt Fac	1.0000				

HAP	Highest WT FRAC	Source
Benzene	0.0044	Tanks 4.09d
Ethylbenzene	0.0025	WTI S/T 6008
Hexane (-n)	0.0228	Tanks 4.09d
Isooctane	0.0175	WTI S/T 6008
Isopropyl benzene	0.0000	Tanks 4.09d
Toluene	0.0083	WTI S/T 6008
Xylene (-m)	0.0067	WTI S/T 6008
Unidentified Comp	0.9637	Tanks 4.09d
Cyclohexane	0.0111	WTI S/T 6008
1,2,4-Trimethylbenzene	0.0000	Tanks 4.09d
Sum Wt Fac	1.0371	

Texas GulfLink, LLC
Offshore Service Vessel (OSV)
MSS - Other Misc. Maintenance

EPN	Description
(OSV) MSS-2	MSS - Other Misc. Maintenance

Filter/Oil Changes, Other Equipment Maintenance

Emissions from miscellaneous maintenance after 20 VLCC loadings are estimated based on the following:

Quantity	Units
6.08	Events/Yr
1	kg VOC/event
2.20	lb VOC/event
4	hr/event
24	hr/yr
1	lb/hr
13.41	lb VOC/yr
0.01	ton VOC/yr

Clearing Module Lines

Emissions from clearing module lines after each VLCC loading are estimated based on the following:

Quantity	Units
183	VLCC Loadings/Yr
4	kg VOC/event
8.82	lb VOC/event
1	hr/event
183	hr/yr
9	lb/hr
1,613.78	lb VOC/yr
0.81	ton VOC/yr

OP16-3C Datasheet

1.1 OP16-3C gas turbine

Table 1.1: Gas turbine specifications	
Compressor	
Type	Centrifugal radial
Compressor ratio	6.7:1
Number of stages	1
Turbine inlet mass flow	8.6 kg/s
Combustion system	
Type	4x Can combustors, 3C
Ignition	Electrical spark plugs
Bearings and bearing housing	
Thrust type	Ball bearing
Radial type	Tilting pad
Turbine	
Type	Radial inflow
Number of stages	1
Exhaust flow	8.8 kg/s
Exhaust temperature	585 °C
Turbine speed	26000 rpm
Shaft speed at gearbox output: 60 Hz application	1800 rpm
Overall dimensions	
Length	2500 mm
Width	1500 mm
Height	1500 mm
Dry weight	1950 kg
Construction materials	
Compressor rotor	Titanium alloy
Compressor shroud and intake casing	Nodular cast iron
Compressor stator vanes	Stainless steel
Hot section heat shields/shrouds	High grade nickel-based alloy
Rotor shaft	Nitriding steel alloy
Engine casing	Heat-resistant pressure vessel steel
Nozzle Guide Vane	Ni-based/ODS alloy
Turbine and exducer impeller	High grade nickel-based alloy
Exhaust diffuser	Stainless steel
Vibration monitoring (in bearing housing)	
Acceleration transducer	1 x sensor
Rotor displacement probes	2x sensor/transmitters

1.2 Gearbox

Table 1.2: Gearbox and coupling specifications	
Gearbox	
Type	GB24-1800
Power rating	2.4 MW
Intermittent overload capability	10% of nominal power for max. 800 hours
Input shaft speed	26000 rpm
Output shaft speed	1800 rpm
Output shaft direction of rotation	Clockwise, facing shaft end
Dry weight	345 kg

1.3 Exhaust emissions

Table 1.3: Exhaust emissions (from 20% to 100% Load)	
NOx *at 15°C and 15 % O_2*	*< 40 ppmv*
CO *at 15°C and 15% O_2*	*< 50 ppmv*
VOC *at 15°C and 15% O_2*	*< 5 ppmv*

The OP16 gas turbine exhaust emissions are entirely driven by the design of the 3C diffusion type combustion system and composition of supplied fuel. The turbine does not contain any additional systems for emission reduction.

The above emissions were calculated with the SVOC-LVOC composition (average LHV 9.4 MJ/Kg). This document was provided by Wartsila on the 25th of March, 2022, under the name “SVOC-LVOC Composition.xlsx”

Appendix C
RACT/BACT/LAER Clearinghouse (RBLC) Search Results

TABLE 1D - VOC RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 & 17.150 & 17.190 - Natural Gas and Others)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
TX-0755	RAMSEY GAS PLANT	Internal Combustion Compressor Engines	Residue gas equivalent to natural gas	206149	MMBtu/yr	Ultra lean-burn engines firing residue gas which is equivalent to natural gas, , and use of oxidation catalysts	0.091	G/HP HR	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine--natural gas (EUNGENGINE)	natural gas	1000	kW	Oxidation catalyst and good combustion practices	0.5	G/HP-H	BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUNGENGINE (Emergency engine--natural gas)	Natural gas	500	H/YR	Oxidation catalyst and good combustion practices.	0.5	G/HP-H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG1--A 1500 HP natural gas fueled emergency engine	Natural gas	1500	HP	Burn natural gas and be NSPS compliant	1	G/HP-H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG2	NATURAL GAS	6000	HP	Burn natural gas and be NSPS compliant.	1	G/HP-H	BACT-PSD
*FL-0368	NUCOR STEEL FLORIDA FACILITY	Emergency Engines	Natural gas	0		Good combustion practices	1	G/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE emergency AC generators	Natural gas	450	kW		1	G/HP-HR	BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-05 - Austenitizing Furnace Rolls Emergency Generator	Natural Gas	636	HP	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	1	G/HP-HR	BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-06 - Tempering Furnace Rolls Emergency Generator	Natural Gas	636	HP	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	1	G/HP-HR	BACT-PSD
TX-0680	SONORA GAS PLANT	Refrigeration compressor engine	natural gas	1183	hp	oxidation catalyst	0.245	G/HP-HR	BACT-PSD
TX-0680	SONORA GAS PLANT	Recompression compressor engine	natural gas	1380	hp	oxidation catalyst	0.245	G/HP-HR	BACT-PSD
TX-0692	RED GATE POWER PLANT	(12) reciprocating internal combustion engines	natural gas	18	MW	oxidation catalyst	0.3	G/HP-HR	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	1775	Horsepower	Oxidation Catalyst	0.22	GM/HP-HR	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	2370	Horsepower	Oxidation Catalyst	0.22	GM/HP-HR	BACT-PSD
OK-0153	ROSE VALLEY PLANT	COMPRESSOR ENGINE 1,775-HP CAT G3606LE	NATURAL GAS	1775	HP	EACH ENGINE EQUIPPED W/OXIDATION CATALYST.	0.13	GM/HP-HR	BACT-PSD
OK-0153	ROSE VALLEY PLANT	EMERGENCY GENERATORS 2,889-HP CAT G3520C IM	NATURAL GAS	2889	HP	OXIDATION CATALYST	0.44	GM/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE electricity generating units (EGUs)	Natural Gas	10	MW		5.82	LB/H	BACT-PSD
MI-0440	MICHIGAN STATE UNIVERSITY	FGENGINES	natural gas	16500	HP	Oxidation catalyst	11	LB/H	BACT-PSD
LA-0292	HOLBROOK COMPRESSOR STATION	Waukesha 16V-275GL Compressor Engines Nos. 1-12	Natural Gas	5000	HP	CO oxidation catalyst, use of natural gas as fuel, good equipment design, and proper combustion techniques	1.25	LB/HR	BACT-PSD
KS-0035	LACEY RANDALL GENERATION FACILITY, LLC	spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs)	Natural gas	12526	BHP	selective catalytic reduction (SCR) system and an oxidation catalyst	2.67	LBS PER HOUR	BACT-PSD
LA-0295	WESTLAKE FACILITY	Reciprocating Internal Combustion Engines 1 and 2 (1-08, EQT 321 & 2-08, EQT 322)	NATURAL GAS AND VENT GAS	11265	HP	Oxidation catalyst and good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (see notes below)	3.35	LB/H	BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1A	Natural Gas	161.4	MMBtu/hour	Oxidation Catalyst for each engine	26	PPMVD AT 15% O2	BACT-PSD

TABLE 1D - VOC RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 & 17.150 & 17.190 - Natural Gas and Others)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1B	Natural Gas	161.4	MMBtu/hour	Oxidation catalyst on each engine	26	PPMVD AT 15% O2	BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1C	Natural Gas	161.4	MMBtu/hour	Oxidation catalyst on each engine	26	PPMVD AT 15% O2	BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1D	Natural Gas	161.4	MMBtu/hour	Oxidation catalyst on each engine	26	PPMVD AT 15% O2	BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1E	Natural Gas	161.4	MMBtu/hour	Oxidation catalyst on each engine	26	PPMVD AT 15% O2	BACT-PSD
OK-0153	ROSE VALLEY PLANT	TURBINES 9,443-HP SIEMENS SGT-200-2S	NATURAL GAS	9443	HP	EFFICIENT DESIGN AND COMBUSTION.	10	PPMVD@15% O2	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Small Combustion Turbines (<25MW)	Natural Gas	10179	Horsepower		25	PPMVD@15% O2	BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Marine Vapor Combustion Units	NATURAL GAS OR FUEL GAS	0		Use of natural gas or fuel gas as supplemental fuel and good combustion practices, including maintaining proper air-to-fuel ratio and necessary residence time, temperature, and turbulence.	0		BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Firewater Pumps	NATURAL GAS OR FUEL GAS	800	HP	Use of well-designed and properly maintained engines. Good combustion practices. Limited to 52 hours per year of non-emergency operation. Equipped with non-resettable runtime meter.	0		BACT-PSD
MI-0443	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN1	natural gas	500	h/yr		0.5	G/HP-H	LAER
MI-0443	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN2	natural gas	500	h/yr		0.5	G/HP-H	LAER
MI-0443	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN3	natural gas	500	h/yr		0.5	G/HP-H	LAER
*MI-0446	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN1	Natural gas	500	h/yr		0.5	G/HP-H	LAER
*MI-0446	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN2	Natural gas	500	h/yr		0.5	G/HP-H	LAER
*MI-0446	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN3	Natural gas	500	h/yr		1	G/HP-H	LAER
*MI-0446	MACK AVENUE ASSEMBLY PLANT	EUEMERGEN4	Natural gas	500	h/yr		1	G/HP-H	LAER
PA-0301	CARPENTER COMPRESSOR STATION	Three Four Stroke Lean Burn Engine - Caterpillar G3608 TA, 2370 BHP	Natural Gas	0		Oxidation Catalyst	0.25	G/BHP-HR	N/A
PA-0301	CARPENTER COMPRESSOR STATION	One four stroke lean burn engine, Caterpillar Model G3612 TA, 3550 bhp	Natural Gas	0		Oxidation Catalyst	0.25	G-BHP-HR	N/A
PA-0302	CLERMONT COMPRESSOR STATION	Spark Ignited 4 stroke Rich Burn Engine (7 units)	Natural Gas	0		NSCR	0.2	G/BHP-HR	N/A
CA-1240	GOLD COAST PACKING	Internal Combustion Engine	Natural gas	881	bhp	Oxidation catalyst	25	PPMVD	OTHER CASE-BY-CASE
PA-0297	KELLY IMG ENERGY LLC/KELLY IMG PLT	3.11 MW GENERATORS (WAUKESHA) #1 and #2	Natural Gas	0			0.176	G/BHP-HR	OTHER CASE-BY-CASE

TABLE 1C - PM, PM_{10} and $PM_{2.5}$ RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
*FL-0368	NUCOR STEEL FLORIDA FACILITY	Emergency Engines	Natural gas	0		Particulate matter, filterable (FPM)	Good combustion practices	0.048	G/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE emergency AC generators	Natural gas	450	kW	Particulate matter, total < 10 Âµ (TPM10)		0.0001	G/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE emergency AC generators	Natural gas	450	kW	Particulate matter, total < 2.5 Âµ (TPM2.5)		0.0001	G/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE emergency AC generators	Natural gas	450	kW	Particulate matter, total (TPM)		0.0001	G/HP-HR	BACT-PSD
IN-0167	MAGNETATION LLC	EMERGENCY GENERATOR	NATURAL GAS	620	HP	Particulate matter, filterable (FPM)	RESTRICTED TO USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	500	H/YR	BACT-PSD
IN-0167	MAGNETATION LLC	FIRE WATER PUMP	NATURAL GAS	300	HP	Particulate matter, filterable (FPM)	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	500	H/YR	BACT-PSD
IN-0167	MAGNETATION LLC	EMERGENCY GENERATOR	NATURAL GAS	620	HP	Particulate matter, total < 10 Âµ (TPM10)	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	500	H/YR	BACT-PSD
IN-0167	MAGNETATION LLC	FIRE WATER PUMP	NATURAL GAS	300	HP	Particulate matter, total < 10 Âµ (TPM10)	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	500	H/YR	BACT-PSD
IN-0167	MAGNETATION LLC	EMERGENCY GENERATOR	NATURAL GAS	620	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	500	H/YR	BACT-PSD
IN-0167	MAGNETATION LLC	FIRE WATER PUMP	NATURAL GAS	300	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	500	H/YR	BACT-PSD
MI-0440	MICHIGAN STATE UNIVERSITY	FGENGINES	natural gas	16500	HP	Particulate matter, filterable (FPM)	Natural gas and good combustion practices.	2	LB/H	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE electricity generating units (EGUs)	Natural Gas	10	MW	Particulate matter, total < 10 Âµ (TPM10)		1.31	LB/H	BACT-PSD
MI-0440	MICHIGAN STATE UNIVERSITY	FGENGINES	natural gas	16500	HP	Particulate matter, total < 10 Âµ (TPM10)	Natural gas and good combustion practices	3	LB/H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG1--A 1500 HP natural gas fueled emergency engine	Natural gas	1500	HP	Particulate matter, total < 10 Âµ (TPM10)	Burn pipeline quality natural gas	0.13	LB/H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG2	NATURAL GAS	6000	HP	Particulate matter, total < 10 Âµ (TPM10)	Burn pipeline quality natural gas.	0.5	LB/H	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE electricity generating units (EGUs)	Natural Gas	10	MW	Particulate matter, total < 2.5 Âµ (TPM2.5)		1.31	LB/H	BACT-PSD
MI-0440	MICHIGAN STATE UNIVERSITY	FGENGINES	natural gas	16500	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Natural gas and good combustion practices	3	LB/H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG1--A 1500 HP natural gas fueled emergency engine	Natural gas	1500	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Burn pipeline quality natural gas	0.13	LB/H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG2	NATURAL GAS	6000	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Burn pipeline quality natural gas.	0.5	LB/H	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE electricity generating units (EGUs)	Natural Gas	10	MW	Particulate matter, total (TPM)		1.31	LB/H	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Solar Titan 130 Centrifugal Compressor Turbine Engine #907 (E08, EQT 13)	Natural Gas	20405	HP	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices	3.06	LB/HR	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Solar Mars 90 Centrifugal Compressor Turbine Engine #908 (E09, EQT 14)	Natural Gas	13699	HP	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices	2.22	LB/HR	BACT-PSD

TABLE 1C - PM, PM_{10} and $PM_{2.5}$ RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
LA-0287	ALEXANDRIA COMPRESSOR STATION	Emergency Generator Reciprocating Engine (G30, EQT 15)	Natural Gas	1175	HP	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices; use of natural gas as fuel; limit non-emergency use to <= 100 hours per year; adherence to the permittee's operating and maintenance practices	0.004	LB/HR	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Solar Titan 130 Centrifugal Compressor Turbine Engine #907 (E08, EQT 13)	Natural Gas	20405	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices	3.06	LB/HR	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Solar Mars 90 Centrifugal Compressor Turbine Engine #908 (E09, EQT 14)	Natural Gas	13699	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices	2.22	LB/HR	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Emergency Generator Reciprocating Engine (G30, EQT 15)	Natural Gas	1175	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices; use of natural gas as fuel; limit non-emergency use to <= 100 hours per year; adherence to the permittee's operating and maintenance practices	0.004	LB/HR	BACT-PSD
LA-0292	HOLBROOK COMPRESSOR STATION	Waukesha 16V-275GL Compressor Engines Nos. 1-12	Natural Gas	5000	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Use of natural gas as fuel, good equipment design, and proper combustion techniques	0.003	LB/HR	BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Marine Vapor Combustion Units	NATURAL GAS OR FUEL GAS	0		Particulate matter, filterable < 10 Âµ (FPM10)	Use of natural gas or fuel gas as supplemental fuel and good combustion practices, including maintaining proper air-to-fuel ratio and necessary residence time, temperature, and turbulence.	0.0076	LB/MMBTU	BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Marine Vapor Combustion Units	NATURAL GAS OR FUEL GAS	0		Particulate matter, filterable < 2.5 Âµ (FPM2.5)	Use of natural gas or fuel gas as supplemental fuel and good combustion practices, including maintaining proper air-to-fuel ratio and necessary residence time, temperature, and turbulence.	0.0076	LB/MMBTU	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine--natural gas (EUNGENGINE)	natural gas	1000	kW	Particulate matter, filterable (FPM)	Good combustion practices	0.0001	LB/MMBTU	BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUNGENGINE (Emergency engine--natural gas)	Natural gas	500	H/YR	Particulate matter, filterable (FPM)	Good combustion practices.	0.0001	LB/MMBTU	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine--natural gas (EUNGENGINE)	natural gas	1000	kW	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices	0.01	LB/MMBTU	BACT-PSD
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	FG-TURBINES	Natural gas	10504	HP	Particulate matter, total < 10 Âµ (TPM10)	Combustion air inlet filter, pipeline quality natural gas and good combustion practices.	0.015	LB/MMBTU	BACT-PSD
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	EUN_EM_GEN	Natural gas	225	H/YR	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices and low sulfur fuel (pipeline quality natural gas).	0.01	LB/MMBTU	BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUNGENGINE (Emergency engine--natural gas)	Natural gas	500	H/YR	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices.	0.01	LB/MMBTU	BACT-PSD
MI-0426	DTE GAS COMPANY - MILFORD COMPRESSOR STATION	EUN_EM_GEN (Natural gas emergency engine).	Natural gas	205	H/YR	Particulate matter, total < 10 Âµ (TPM10)	Good combustion practices and low sulfur fuel (pipeline quality natural gas).	0.01	LB/MMBTU	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine--natural gas (EUNGENGINE)	natural gas	1000	kW	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices	0.01	LB/MMBTU	BACT-PSD
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	FG-TURBINES	Natural gas	10504	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	Combustion air inlet filter, pipeline quality natural gas and good combustion practices.	0.015	LB/MMBTU	BACT-PSD

TABLE 1C - PM, PM_{10} and $PM_{2.5}$ RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	EUN_EM_GEN	Natural gas	225	H/YR	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices and low sulfur fuel (pipeline quality natural gas).	0.01	LB/MMBTU	BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUNGENGINE (Emergency engine--natural gas)	Natural gas	500	H/YR	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices.	0.01	LB/MMBTU	BACT-PSD
MI-0426	DTE GAS COMPANY - MILFORD COMPRESSOR STATION	EUN_EM_GEN (Natural gas emergency engine).	Natural gas	205	H/YR	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion practices and low sulfur fuel (pipeline quality natural gas).	0.01	LB/MMBTU	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	1775	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)		0.01	LB/MMBTU	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	2370	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)		0.01	LB/MMBTU	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Small Combustion Turbines (<25MW)	Natural Gas	10179	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)		0.0066	LB/MMBTU	BACT-PSD
OK-0153	ROSE VALLEY PLANT	COMPRESSOR ENGINE 1,775-HP CAT G3606LE	NATURAL GAS	1775	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	NATURAL GAS COMBUSTION PRACTICES.	0.01	LB/MMBTU	BACT-PSD
OK-0153	ROSE VALLEY PLANT	TURBINES 9,443-HP SIEMENS SGT-200-2S	NATURAL GAS	9443	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	NATURAL GAS COMBUSTION.	0.0066	LB/MMBTU	BACT-PSD
OK-0153	ROSE VALLEY PLANT	EMERGENCY GENERATORS 2,889-HP CAT G3520C IM	NATURAL GAS	2889	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	NATURAL GAS COMBUSTION	0.01	LB/MMBTU	BACT-PSD
KS-0035	LACEY RANDALL GENERATION FACILITY, LLC	spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs)	Natural gas	12526	BHP	Particulate matter, total < 10 Âµ (TPM10)	selective catalytic reduction (SCR) system and an oxidation catalyst	2.22	LBS PER HOUR	BACT-PSD
KS-0035	LACEY RANDALL GENERATION FACILITY, LLC	spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs)	Natural gas	12526	BHP	Particulate matter, total < 2.5 Âµ (TPM2.5)	selective catalytic reduction (SCR) system and an oxidation catalyst	2.22	LBS PER HOUR	BACT-PSD
KS-0035	LACEY RANDALL GENERATION FACILITY, LLC	spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs)	Natural gas	12526	BHP	Particulate matter, total (TPM)	selective catalytic reduction (SCR) system and an oxidation catalyst	1.44	LBS PER HOUR	BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Firewater Pumps	NATURAL GAS OR FUEL GAS	800	HP	Particulate matter, filterable < 10 Âµ (FPM10)	Use of well-designed and properly maintained engines. Good combustion practices. Limited to 52 hours per year of non-emergency operation. Equipped with non-resettable runtime meter.	0		BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Firewater Pumps	NATURAL GAS OR FUEL GAS	800	HP	Particulate matter, filterable < 2.5 Âµ (FPM2.5)	Use of well-designed and properly maintained engines. Good combustion practices. Limited to 52 hours per year of non-emergency operation. Equipped with non-resettable runtime meter.	0		BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-05 - Austenitizing Furnace Rolls Emergency Generator	Natural Gas	636	HP	Particulate matter, filterable (FPM)	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	0		BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-06 - Tempering Furnace Rolls Emergency Generator	Natural Gas	636	HP	Particulate matter, filterable (FPM)	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	0		BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Firewater Pumps	NATURAL GAS OR FUEL GAS	800	HP	Particulate matter, filterable (FPM)	Use of well-designed and properly maintained engines. Good combustion practices. Limited to 52 hours per year of non-emergency operation. Equipped with non-resettable runtime meter.	0		BACT-PSD

TABLE 1C - PM, PM_{10} and $PM_{2.5}$ RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-05 - Austenitizing Furnace Rolls Emergency Generator	Natural Gas	636	HP	Particulate matter, total < 10 Âµ (TPM10)	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	0		BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-06 - Tempering Furnace Rolls Emergency Generator	Natural Gas	636	HP	Particulate matter, total < 10 Âµ (TPM10)	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	0		BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-05 - Austenitizing Furnace Rolls Emergency Generator	Natural Gas	636	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	0		BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-06 - Tempering Furnace Rolls Emergency Generator	Natural Gas	636	HP	Particulate matter, total < 2.5 Âµ (TPM2.5)	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	0		BACT-PSD
TX-0692	RED GATE POWER PLANT	(12) reciprocating internal combustion engines	natural gas	18	MW	Particulate matter, total < 2.5 Âµ (TPM2.5)		0		BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1A	Natural Gas	161.4	MMBtu/hour	Particulate matter, total (TPM)	Good combustion practices (i.e., advanced lean-burn engine design, ignition timing, and air-to-fuel ration controllers with regular and preventative maintenance as recommended by the manufacturer) along with combustion of pipeline-quality natural gas shall be utilized to minimize emissions of PM/PM10/PM2.5 emissions. In addition, as measured by reference method stack test, ammonia slip from each engine shall not exceed 10 ppmv to minimize PM2.5 emissions	0		BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1B	Natural Gas	161.4	MMBtu/hour	Particulate matter, total (TPM)	Good combustion practices (i.e., advanced lean-burn engine design, ignition timing, and air-to-fuel ration controllers with regular and preventative maintenance as recommended by the manufacturer) along with combustion of pipeline-quality natural gas shall be utilized to minimize emissions of PM/PM10/PM2.5 emissions. In addition, as measured by reference method stack test, ammonia slip from each engine shall not exceed 10 ppmv to minimize PM2.5 emissions.	0		BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1C	Natural Gas	161.4	MMBtu/hour	Particulate matter, total (TPM)	Good combustion practices (i.e., advanced lean-burn engine design, ignition timing, and air-to-fuel ration controllers with regular and preventative maintenance as recommended by the manufacturer) along with combustion of pipeline-quality natural gas shall be utilized to minimize emissions of PM/PM10/PM2.5 emissions. In addition, as measured by reference method stack test, ammonia slip from each engine shall not exceed 10 ppmv to minimize PM2.5 emissions.	0		BACT-PSD
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1D	Natural Gas	161.4	MMBtu/hour	Particulate matter, total (TPM)	Good combustion practices (i.e., advanced lean-burn engine design, ignition timing, and air-to-fuel ration controllers with regular and preventative maintenance as recommended by the manufacturer) along with combustion of pipeline-quality natural gas shall be utilized to minimize emissions of PM/PM10/PM2.5 emissions. In addition, as measured by reference method stack test, ammonia slip from each engine shall not exceed 10 ppmv to minimize PM2.5 emissions.	0		BACT-PSD

TABLE 1C - PM, PM_{10} and $PM_{2.5}$ RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
*FL-0370	ARVAH B. HOPKINS GENERATING STATION	18.82 MW SI Internal Combustion Engine Unit 1E	Natural Gas	161.4	MMBtu/hour	Particulate matter, total (TPM)	Good combustion practices (i.e., advanced lean-burn engine design, ignition timing, and air-to-fuel ration controllers with regular and preventative maintenance as recommended by the manufacturer) along with combustion of pipeline-quality natural gas shall be utilized to minimize emissions of PM/PM10/PM2.5 emissions. In addition, as measured by reference method stack test, ammonia slip from each engine shall not exceed 10 ppmv to minimize PM2.5 emissions.	0		BACT-PSD

TABLE 1B - NOx RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 & 17.150 & 17.190 - Natural Gas and Others)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
TX-0755	RAMSEY GAS PLANT	Internal Combustion Compressor Engines	Residue gas equivalent to natural gas	206149	MMBtu/yr	Ultra Lean-burn engines firing natural gas	0.5	G/HP HR	BACT-PSD
IN-0167	MAGNETATION LLC	EMERGENCY GENERATOR	NATURAL GAS	620	HP	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	0.5	G/HP-H	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine--natural gas (EUNGENGINE)	natural gas	1000	kW	Good combustion practices	2	G/HP-H	BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUNGENGINE (Emergency engine--natural gas)	Natural gas	500	H/YR	Good combustion practices.	2	G/HP-H	BACT-PSD
MI-0440	MICHIGAN STATE UNIVERSITY	FGENGINES	natural gas	16500	HP	Selective catalytic reduction	0.5	G/HP-H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG1--A 1500 HP natural gas fueled emergency engine	Natural gas	1500	HP	Burn natural gas and be NSPS compliant.	2	G/HP-H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG2	NATURAL GAS	6000	HP	Burn natural gas and be NSPS compliant	2	G/HP-H	BACT-PSD
TX-0642	SINTON COMPRESSOR STATION	Emergency Engine	natural gas	1328	hp		2	G/HP-H	BACT-PSD
*FL-0368	NUCOR STEEL FLORIDA FACILITY	Emergency Engines	Natural gas	0		Good combustion practices	2	G/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE emergency AC generators	Natural gas	450	kW		2	G/HP-HR	BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-05 - Austenitizing Furnace Rolls Emergency Generator	Natural Gas	636	HP	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	2	G/HP-HR	BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-06 - Tempering Furnace Rolls Emergency Generator	Natural Gas	636	HP	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	2	G/HP-HR	BACT-PSD
TX-0680	SONORA GAS PLANT	Refrigeration compressor engine	natural gas	1183	hp	ultra-lean burn technology	0.5	G/HP-HR	BACT-PSD
TX-0680	SONORA GAS PLANT	Recompression compressor engine	natural gas	1380	hp	ultra-lean burn technology	0.5	G/HP-HR	BACT-PSD
TX-0692	RED GATE POWER PLANT	(12) reciprocating internal combustion engines	natural gas	18	MW	Selective Catalytic Reduction (SCR)	0.084	G/HP-HR	BACT-PSD
IN-0167	MAGNETATION LLC	FIRE WATER PUMP	NATURAL GAS	300	HP	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES	0.5	G/HP-YR	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	1775	Horsepower	Ultra Lean Burn	0.5	GM/HP-HR	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	2370	Horsepower	Ultra Lean Burn	0.5	GM/HP-HR	BACT-PSD
OK-0153	ROSE VALLEY PLANT	COMPRESSOR ENGINE 1,775-HP CAT G3606LE	NATURAL GAS	1775	HP		0.5	GM/HP-HR	BACT-PSD
OK-0153	ROSE VALLEY PLANT	EMERGENCY GENERATORS 2,889-HP CAT G3520C IM	NATURAL GAS	2889	HP	LEAN-BURN COMBUSTION.	0.5	GM/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE electricity generating units (EGUs)	Natural Gas	10	MW		2.13	LB/H	BACT-PSD
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	EUN_EM_GEN	Natural gas	225	H/YR	Low NOx design (turbo charger and after cooler) and good combustion practices.	4.8	LB/H	BACT-PSD
MI-0426	DTE GAS COMPANY - MILFORD COMPRESSOR STATION	EUN_EM_GEN (Natural gas emergency engine).	Natural gas	205	H/YR	Low NOx design (turbo charger and after cooler) and good combustion practices.	4	LB/H	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Solar Titan 130 Centrifugal Compressor Turbine Engine #907 (E08, EQT 13)	Natural Gas	20405	HP	Dry low NOx combustion; good combustion practices; annual compliance testing	9.23	LB/HR	BACT-PSD
LA-0287	ALEXANDRIA COMPRESSOR STATION	Solar Mars 90 Centrifugal Compressor Turbine Engine #908 (E09, EQT 14)	Natural Gas	13699	HP	Dry low NOx combustion; good combustion practices; annual compliance testing	6.64	LB/HR	BACT-PSD

TABLE 1B - NOx RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 & 17.150 & 17.190 - Natural Gas and Others)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
LA-0287	ALEXANDRIA COMPRESSOR STATION	Emergency Generator Reciprocating Engine (G30, EQT 15)	Natural Gas	1175	HP	Good combustion practices; use of natural gas as fuel; limit non-emergency use to <= 100 hours per year; adherence to the permittee's operating and maintenance practices	5.18	LB/HR	BACT-PSD
LA-0292	HOLBROOK COMPRESSOR STATION	Waukesha 16V-275GL Compressor Engines Nos. 1-12	Natural Gas	5000	HP	Lean-burn combustion, use of natural gas as fuel, good equipment design, and proper combustion techniques	4.96	LB/HR	BACT-PSD
KS-0035	LACEY RANDALL GENERATION FACILITY, LLC	spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs)	Natural gas	12526	BHP	Selective Catalytic Reduction (SCR) system and oxidation catalyst	1.45	LBS PER HOUR	BACT-PSD
LA-0295	WESTLAKE FACILITY	Reciprocating Internal Combustion Engines 1 and 2 (1-08, EQT 321 & 2-08, EQT 322)	NATURAL GAS AND VENT GAS	11265	HP	Good combustion practices, including good equipment design, use of gaseous fuels for good mixing, and proper combustion techniques (see notes below)	14.67	LB/H	BACT-PSD
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	FG-TURBINES	Natural gas	10504	HP	Dry ultra-low NOx burners	15	PPM	BACT-PSD
TX-0642	SINTON COMPRESSOR STATION	Compression Turbine	natural gas	20000	hp	Solar's SoLoNOx dry emission control technology	25	PPMVD	BACT-PSD
OK-0153	ROSE VALLEY PLANT	TURBINES 9,443-HP SIEMENS SGT-200-2S	NATURAL GAS	9443	HP	DRY LOW-NOx COMBUSTION.	15	PPMVD @15% O2	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Small Combustion Turbines (<25MW)	Natural Gas	10179	Horsepower	Dry-Low NOx Combustion	15	PPMVD@15% O2	BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Firewater Pumps	NATURAL GAS OR FUEL GAS	800	HP	Use of well-designed and properly maintained engines. Good combustion practices. Limited to 52 hours per year of non-emergency operation. Equipped with non-resettable runtime meter.	0		BACT-PSD
PA-0301	CARPENTER COMPRESSOR STATION	Three Four Stroke Lean Burn Engine - Caterpillar G3608 TA, 2370 BHP	Natural Gas	0			0.5	G/BHP-HR	N/A
PA-0301	CARPENTER COMPRESSOR STATION	One four stroke lean burn engine, Caterpillar Model G3612 TA, 3550 bhp	Natural Gas	0			0.5	G/BHP-HR	N/A
PA-0302	CLERMONT COMPRESSOR STATION	Spark Ignited 4 stroke Rich Burn Engine (7 units)	Natural Gas	0		NSCR	0.2	G/BHP-HR	N/A
CA-1240	GOLD COAST PACKING	Internal Combustion Engine	Natural gas	881	bhp	SCR catalyst-Urea injection	5	PPMVD	OTHER CASE-BY-CASE
PA-0297	KELLY IMG ENERGY LLC/KELLY IMG PLT	3.11 MW GENERATORS (WAUKESHA) #1 and #2	Natural Gas	0			0.5	G/BHP-HR	OTHER CASE-BY-CASE
*PA-0303	NATL FUEL GAS SUPPLY/ELLISBURG STA	Emergency Generator Set, Rich Burn, 850 BHP	NG	0		Miratech model IQ-24-10-EC1 NSCR system	0.5	G/BHP-HR	OTHER CASE-BY-CASE

TABLE 1A - CO RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
TX-0755	RAMSEY GAS PLANT	Internal Combustion Compressor Engines	Residue gas equivalent to natural gas	206149	MMBtu/yr	Ultra Lean-burn engines firing residue gas (with low carbon density) which is equivalent to natural gas, and use of oxidation catalysts	0.083	G/HP HR	BACT-PSD
MI-0412	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	Emergency Engine--natural gas (EUNGENGINE)	natural gas	1000	kW	Oxidation catalyst and good combustion practices.	0.8	G/HP-H	BACT-PSD
MI-0424	HOLLAND BOARD OF PUBLIC WORKS - EAST 5TH STREET	EUNGENGINE (Emergency engine--natural gas)	Natural gas	500	H/YR	Oxidation catalyst and good combustion practices.	0.8	G/HP-H	BACT-PSD
MI-0440	MICHIGAN STATE UNIVERSITY	FGENGINES	natural gas	16500	HP	Oxidation catalyst	0.3	G/HP-H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG1--A 1500 HP natural gas fueled emergency engine	Natural gas	1500	HP	Burn natural gas and be NSPS compliant	4	G/HP-H	BACT-PSD
MI-0441	LBWL--ERICKSON STATION	EUEMGNG2	NATURAL GAS	6000	HP	Burn natural gas and be NSPS compliant.	4	G/HP-H	BACT-PSD
TX-0642	SINTON COMPRESSOR STATION	Emergency Engine	natural gas	1328	hp		1.3	G/HP-H	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE emergency AC generators	Natural gas	450	kW		4	G/HP-HR	BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-05 - Austenitizing Furnace Rolls Emergency Generator	Natural Gas	636	HP	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	4	G/HP-HR	BACT-PSD
KY-0110	NUCOR STEEL BRANDENBURG	EP 10-06 - Tempering Furnace Rolls Emergency Generator	Natural Gas	636	HP	This EP is required to have a Good Combustion and Operating Practices (GCOP) Plan.	4	G/HP-HR	BACT-PSD
TX-0680	SONORA GAS PLANT	Refrigeration compressor engine	natural gas	1183	hp	oxidation catalyst	0.252	G/HP-HR	BACT-PSD
TX-0680	SONORA GAS PLANT	Recompression compressor engine	natural gas	1380	hp	oxidation catalyst	0.252	G/HP-HR	BACT-PSD
TX-0692	RED GATE POWER PLANT	(12) reciprocating internal combustion engines	natural gas	18	MW	oxidation catalyst	0.3	G/HP-HR	BACT-PSD
*FL-0368	NUCOR STEEL FLORIDA FACILITY	Emergency Engines	Natural gas	0		good combustion practices	4	G-HP-HR	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	1775	Horsepower	Oxidation Catalyst	0.55	GM/HP-HR	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Large Internal Combustion Engines (>500 hp)	Natural Gas	2370	Horsepower	Oxidation Catalyst	0.55	GM/HP-HR	BACT-PSD
OK-0153	ROSE VALLEY PLANT	COMPRESSOR ENGINE 1,775-HP CAT G3606LE	NATURAL GAS	1775	HP	EACH ENGINE EQUIPPED W/OXIDATION CATALYST.	0.36	GM/HP-HR	BACT-PSD
OK-0153	ROSE VALLEY PLANT	EMERGENCY GENERATORS 2,889-HP CAT G3520C IM	NATURAL GAS	2889	HP	OXIDATION CATALYST	0.43	GM/HP-HR	BACT-PSD
*KS-0030	MID-KANSAS ELECTRIC COMPANY, LLC - RUBART STATION	Spark ignition RICE electricity generating units (EGUs)	Natural Gas	10	MW		3.86	LB/H	BACT-PSD
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	EUN_EM_GEN	Natural gas	225	H/YR	Good combustion practices and clean burn fuel (pipeline quality natural gas).	9.6	LB/H	BACT-PSD
MI-0426	DTE GAS COMPANY - MILFORD COMPRESSOR STATION	EUN_EM_GEN (Natural gas emergency engine).	Natural gas	205	H/YR	Good combustion practices and clean burn fuel (pipeline quality natural gas).	11	LB/H	BACT-PSD
LA-0311	DONALDSONVILLE NITROGEN COMPLEX	No. 6 Ammonia Plant Emergency Generator (16-13) and No. 5 Urea Plant Emergency Generator A (32-13) (EQTs 167 & 181)	Natural Gas	300	HP	Good combustion practices; proper equipment design consistent with 40 CFR 60 Subpart JJJJ	3.31	LB/HR	BACT-PSD
LA-0311	DONALDSONVILLE NITROGEN COMPLEX	No. 5 Urea Plant Emergency Generator B (33-13, EQT 182)	Natural Gas	2500	HP	Good combustion practices; proper equipment design consistent with 40 CFR 60 Subpart JJJJ	27.56	LB/HR	BACT-PSD
KS-0035	LACEY RANDALL GENERATION FACILITY, LLC	spark ignition four stroke lean burn reciprocating internal combustion engine (RICE) electric generating units (EGUs)	Natural gas	12526	BHP	selective catalytic reduction (SCR) system and an oxidation catalyst	2.67	LBS PER HOUR	BACT-PSD

TABLE 1A - CO RBLC Search Data for Internal Combustion Engines > 500 BHP (Section 17.130 - Natural Gas)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
MI-0420	DTE GAS COMPANY--MILFORD COMPRESSOR STATION	FG-TURBINES	Natural gas	10504	HP	Good combustion practices and clean burn fuel (pipeline quality natural gas).	25	PPM	BACT-PSD
TX-0642	SINTON COMPRESSOR STATION	Compression Turbine	natural gas	20000	hp	Solar's SoLoNOx dry emission control technology	50	PPMVD	BACT-PSD
OK-0153	ROSE VALLEY PLANT	TURBINES 9,443-HP SIEMENS SGT-200-2S	NATURAL GAS	9443	HP	EFFICIENT DESIGN AND COMBUSTION.	15	PPMVD @15% O2	BACT-PSD
OK-0148	BUFFALO CREEK PROCESSING PLANT	Small Combustion Turbines (<25MW)	Natural Gas	10179	Horsepower		25	PPMVD@15% O2	BACT-PSD
MI-0413	AK STEEL	FG-ENG2007>500 â€“ Two natural gas fired SI engines greater than 500 hp	natural gas	0			0		BACT-PSD
MI-0413	AK STEEL	FG-ENG2007<500 â€“ Four natural gas fired SI engines less than 500 hp	Natural gas	0			0		BACT-PSD
*TX-0930	CENTURION BROWNSVILLE	Firewater Pumps	NATURAL GAS OR FUEL GAS	800	HP	Use of well-designed and properly maintained engines. Good combustion practices. Limited to 52 hours per year of non-emergency operation. Equipped with non-resettable runtime meter.	0		BACT-PSD
PA-0301	CARPENTER COMPRESSOR STATION	Three Four Stroke Lean Burn Engine - Caterpillar G3608 TA, 2370 BHP	Natural Gas	0		Oxidation Catalyst	47	PPMVD	N/A
PA-0301	CARPENTER COMPRESSOR STATION	One four stroke lean burn engine, Caterpillar Model G3612 TA, 3550 bhp	Natural Gas	0		Oxidation catalyst	47	PPMVD	N/A
PA-0302	CLERMONT COMPRESSOR STATION	Spark Ignited 4 stroke Rich Burn Engine (7 units)	Natural Gas	0		NSCR	0.3	G/BHP-HR	N/A
CA-1240	GOLD COAST PACKING	Internal Combustion Engine	Natural gas	881	bhp	Oxidation catalyst	54	PPMVD	OTHER CASE-BY-CASE
PA-0297	KELLY IMG ENERGY LLC/KELLY IMG PLT	3.11 MW GENERATORS (WAUKESHA) #1 and #2	Natural Gas	0		CO Catalyst	0.08	G/BHP-HR	OTHER CASE-BY-CASE

TABLE 4A - VOC RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)									
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	0.141	G/BHP-H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	No. 2 Distillate Fuel Oil	900	BHP	utilize efficient combustion/design technology	0.015	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	0.141	G/B-HP-H	BACT-PSD
TX-0915	UNIT 5	DIESEL GENERATOR	DIESEL	0		LIMITED 500 HR/YR OPERATION	0.5	G/HPHR	BACT-PSD
*AK-0085	GAS TREATMENT PLANT	One (1) Black Start Generator Engine	ULSD	186.6	gph	Oxidation Catalyst, Good combustion practices, and limit operation to 500 hours per year.	0.18	G/HP-HR	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	0.62	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - C.R. Luigs	Diesel	5875	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler.	0.39	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	Diesel	9910	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0.35	G/KW-H	BACT-PSD
OH-0374	GUERNSEY POWER STATION LLC	Emergency Generators (2 identical, P004 and P005)	Diesel fuel	2206	HP	Certified to the meet the emissions standards in 40 CFR 89.112 and 89.113 pursuant to 40 CFR 60.4205(b) and 60.4202(a)(2). Good combustion practices per the manufacturerâ€™s operating manual.	23.21	LB/H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Airstrip Generator Engine	Ultra Low Sulfur Diesel	490	hp		0.0025	LB/HP-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Bulk Tank Generator Engines	Ultra Low Sulfur Diesel	891	hp		0.0007	LB/HP-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	0.57	T/12MO ROLLING TOTAL	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Wireline Unit Diesel Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler	1.17	TONS	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Water Blasting Diesel Engine	Diesel	208	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Well Evaluation Diesel Engine	Diesel	140	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD

TABLE 4A - VOC RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)									
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Fast Rescue Craft Diesel Engine	Diesel	230	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	Diesel Engines	Diesel	0		good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII	0		BACT-PSD
NY-0103	CRICKET VALLEY ENERGY CENTER	Black start generator	ultra low sulfur diesel	3000	KW	Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	0.11	G/BHP-H	LAER
LA-0318	FLOPAM FACILITY	Diesel Engines		0		Complying with 40 CFR 60 Subpart IIII	0		LAER
MA-0043	MIT CENTRAL UTILITY PLANT	Cold Start Engine	ULSD	19.04	MMBTU/HR		0.85	LB/HR	OTHER CASE-BY-CASE

TABLE 3A - PM, PM$_{10}$, PM$_{2.5}$ RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	Particulate matter, filterable (FPM)	GOOD COMBUSTION PRACTICES	0.15	G/BHP-H	BACT-PSD
NY-0103	CRICKET VALLEY ENERGY CENTER	Black start generator	ultra low sulfur diesel	3000	KW	Particulate matter, filterable (FPM)	Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	0.15	G/BHP-H	BACT-PSD
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	Particulate matter, total < 10 Âμ (TPM10)	GOOD COMBUSTION PRACTICES	0.15	G/BHP-H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	No. 2 Distillate Fuel Oil	900	BHP	Particulate matter, total < 10 Âμ (TPM10)	utilize efficient combustion/design technology	0.066	G/BHP-H	BACT-PSD
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	Particulate matter, total < 2.5 Âμ (TPM2.5)	GOOD COMBUSTION PRACTICES	0.15	G/BHP-H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	No. 2 Distillate Fuel Oil	900	BHP	Particulate matter, total (TPM)	utilize efficient combustion/design technology	0.066	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	Particulate matter, filterable (FPM)	GOOD COMBUSTION PRACTICES	0.15	G/B-HP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	Particulate matter, total < 10 Âμ (TPM10)	GOOD COMBUSTION PRACTICES	0.15	G/B-HP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	Particulate matter, total < 2.5 Âμ (TPM2.5)	GOOD COMBUSTION PRACTICES	0.15	G/B-HP-H	BACT-PSD
TX-0915	UNIT 5	DIESEL GENERATOR	DIESEL	0		Particulate matter, filterable < 10 Âμ (FPM10)	LIMITED 500 HR/YR OPERATION	0.022	G/HPHR	BACT-PSD
TX-0915	UNIT 5	DIESEL GENERATOR	DIESEL	0		Particulate matter, filterable (FPM)	LIMITED 500 HR/YR OPERATION	0.022	G/HPHR	BACT-PSD
*AK-0085	GAS TREATMENT PLANT	One (1) Black Start Generator Engine	ULSD	186.6	gph	Particulate matter, total < 10 Âμ (TPM10)	Good combustion practices, ULSD, and limit operation to 500 hours per year.	0.045	G/HP-HR	BACT-PSD
*AK-0085	GAS TREATMENT PLANT	One (1) Black Start Generator Engine	ULSD	186.6	gph	Particulate matter, total < 2.5 Âμ (TPM2.5)	Good combustion practices, ULSD, and limit operation to 500 hours per year.	0.045	G/HP-HR	BACT-PSD
*AK-0085	GAS TREATMENT PLANT	One (1) Black Start Generator Engine	ULSD	186.6	gph	Particulate matter, total (TPM)	Good combustion practices, ULSD, and limit operation to 500 hours per year.	0.045	G/HP-HR	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - Development Driller 1	Diesel	0		Particulate matter, filterable < 10 Âμ (FPM10)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	0.43	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - C.R. Luigs	Diesel	5875	hp	Particulate matter, filterable < 10 Âμ (FPM10)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler.	0.24	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - Development Driller 1	Diesel	0		Particulate matter, filterable < 2.5 Âμ (FPM2.5)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	0.57	G/KW-H	BACT-PSD

TABLE 3A - PM, PM_{10}, $PM_{2.5}$ RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)											
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - C.R. Luigs	Diesel	5875	hp	Particulate matter, filterable < 2.5 Âµ (FPM2.5)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler.	0.24	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - Development Driller 1	Diesel	0		Particulate matter, filterable (FPM)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	0.43	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - C.R. Luigs	Diesel	5875	hp	Particulate matter, filterable (FPM)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler.	0.43	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	Diesel	9910	hp	Particulate matter, total < 10 Âµ (TPM10)	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0.24	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	Diesel	9910	hp	Particulate matter, total < 2.5 Âµ (TPM2.5)	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0.24	G/KW-H	BACT-PSD
AK-0076	POINT THOMSON PRODUCTION FACILITY	Combustion of Diesel by ICEs	ULSD	1750	kW	Particulate matter, total < 2.5 Âµ (TPM2.5)		0.2	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	Diesel	9910	hp	Particulate matter, total (TPM)	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0.43	G/KW-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Airstrip Generator Engine	Ultra Low Sulfur Diesel	490	hp	Particulate matter, filterable < 10 Âµ (FPM10)		0.15	GRAMS/HP-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Bulk Tank Generator Engines	Ultra Low Sulfur Diesel	891	hp	Particulate matter, filterable < 10 Âµ (FPM10)		0.15	GRAMS/HP-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Airstrip Generator Engine	Ultra Low Sulfur Diesel	490	hp	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		0.15	GRAMS/HP-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Bulk Tank Generator Engines	Ultra Low Sulfur Diesel	891	hp	Particulate matter, filterable < 2.5 Âµ (FPM2.5)		0.15	GRAMS/HP-H	BACT-PSD
MA-0043	MIT CENTRAL UTILITY PLANT	Cold Start Engine	ULSD	19.04	MMBTU/HR	Particulate matter, total < 10 Âµ (TPM10)		0.4	LB/HR	BACT-PSD
MA-0043	MIT CENTRAL UTILITY PLANT	Cold Start Engine	ULSD	19.04	MMBTU/HR	Particulate matter, total < 2.5 Âµ (TPM2.5)		0.4	LB/HR	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	Diesel	0		Particulate matter, total < 10 Âµ (TPM10)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	0.25	T/12MO ROLLING TOTAL	BACT-PSD

TABLE 3A - PM, PM_{10}, $PM_{2.5}$ RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)

RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGH PUT	UNIT	POLLUTANT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	Diesel	0		Particulate matter, total < 2.5 Âµ (TPM2.5)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	0.25	T/12MO ROLLING TOTAL	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	Diesel	0		Particulate matter, total (TPM)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	0.41	T/12MO ROLLING TOTAL	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Wireline Unit Diesel Engines - Development Driller 1	Diesel	0		Particulate matter, total (TPM)	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler	0.6	TONS	BACT-PSD
OH-0379	PETMIN USA INCORPORATED	Black Start Generator (P007)	Diesel fuel	158	HP	Particulate matter, filterable < 10 Âµ (FPM10)	Tier IV engine Good combustion practices	5.22	X10-3 LB/H	BACT-PSD
OH-0379	PETMIN USA INCORPORATED	Black Start Generator (P007)	Diesel fuel	158	HP	Particulate matter, filterable < 2.5 Âµ (FPM2.5)	Tier IV engine Good combustion practices	5.22	X10-3 LB/H	BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	Diesel Engines	Diesel	0		Particulate matter, total < 10 Âµ (TPM10)	good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Standby Generator No. 9 Engine	Diesel Fuel	400	hp	Particulate matter, total < 10 Âµ (TPM10)	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0318	FLOPAM FACILITY	Diesel Engines		0		Particulate matter, total < 10 Âµ (TPM10)	Complying with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	Diesel Engines	Diesel	0		Particulate matter, total < 2.5 Âµ (TPM2.5)	good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Standby Generator No. 9 Engine	Diesel Fuel	400	hp	Particulate matter, total < 2.5 Âµ (TPM2.5)	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Water Blasting Diesel Engine	Diesel	208	hp	Particulate matter, total (TPM)	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Well Evaluation Diesel Engine	Diesel	140	hp	Particulate matter, total (TPM)	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Fast Rescue Craft Diesel Engine	Diesel	230	hp	Particulate matter, total (TPM)	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
AK-0081	POINT THOMSON PRODUCTION FACILITY	Combustion	ULSD	610	hp	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good operation and combustion practices	0.15	G/KW-H	OTHER CASE BY-CASE
AK-0081	POINT THOMSON PRODUCTION FACILITY	Combustion	ULSD	493	hp	Particulate matter, total < 2.5 Âµ (TPM2.5)	Good combustion and operating practices.	0.2	G/KW-H	OTHER CASE BY-CASE
*PA-0292	ML 35 LLC/PHILA CYBERCENTER	DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS	#2 Oil	0		Particulate matter, total (TPM)		0.28	LB/H	OTHER CASE BY-CASE

TABLE 2A - NOx RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)									
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.83	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.83	G/B-HP-H	BACT-PSD
*AK-0085	GAS TREATMENT PLANT	One (1) Black Start Generator Engine	ULSD	186.6	gph	Good combustion practices, limit operation to 500 hours per year.	3.3	G/HP-HR	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	12.1	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - C.R. Luigs	Diesel	5875	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	18.1	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	Diesel	9910	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	12.7	G/KW-H	BACT-PSD
FL-0348	MURPHY EXPLORATION & PRODUCTION CO.	Main Propulsion Generators	Diesel	4425	hp	Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturerâ€™s specifications for each engine	26	G/KW-H	BACT-PSD
FL-0348	MURPHY EXPLORATION & PRODUCTION CO.	Drill Floor and Crew Quarters Electrical Generators	Diesel	6789	hp	Use of engine with turbo charger with after cooler, an enhanced work practice power management, NOx emissions maintenance system, and good combustion and maintenance practices based on the current manufacturerâ€™s specifications for each engine.	26	G/KW-H	BACT-PSD
AK-0076	POINT THOMSON PRODUCTION FACILITY	Combustion of Diesel by ICEs	ULSD	1750	kW		6.4	G/KW-H	BACT-PSD
TX-0671	PROJECT JUMBO	Engines	ultra low sulfur diesel fuel	0		Each emergency generator's emission factor is based on EPA's Tier 2 standards at 40CFR89.112 for NOx	5.43	G/KW-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Airstrip Generator Engine	Ultra Low Sulfur Diesel	490	hp		4.8	GRAMS/HP-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Bulk Tank Generator Engines	Ultra Low Sulfur Diesel	891	hp		4.8	GRAMS/HP-H	BACT-PSD

TABLE 2A - NOx RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)									
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
OH-0379	PETMIN USA INCORPORATED	Black Start Generator (P007)	Diesel fuel	158	HP	Tier IV engine Tier IV NSPS standards certified by engine manufacturer.	0.104	LB/H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	No. 2 Distillate Fuel Oil	900	BHP	utilize efficient combustion/design technology	14	LB/HR	BACT-PSD
AK-0076	POINT THOMSON PRODUCTION FACILITY	Combustion of Diesel	ULSD	7520	kW	Dry Low NOx and SoLoNOx. DLN and SoLoNOx combustors utilize multistage premix combustors where the air and fuel is mixed at a lean fuel to air ratio. The excess air in the lean mixture acts as a heat sink, which lowers peak combustion temperatures and also ensures a more homogeneous mixture, both resulting in greatly reduced NOX formation rates.	96	PPMV	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	9.5	T/12MO ROLLING TOTAL	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Wireline Unit Diesel Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler	8.92	TONS	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Water Blasting Diesel Engine	Diesel	208	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Well Evaluation Diesel Engine	Diesel	140	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Fast Rescue Craft Diesel Engine	Diesel	230	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	Diesel Engines	Diesel	0		good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Standby Generator No. 9 Engine	Diesel Fuel	400	hp	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0318	FLOPAM FACILITY	Diesel Engines		0		Complying with 40 CFR 60 Subpart IIII	0		BACT-PSD

TABLE 2A - NOx RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)									
RBLCID	**FACILITY NAME**	**PROCESS NAME**	**PRIMARY FUEL**	**THROUGHPUT**	**UNIT**	**CONTROL METHOD DESCRIPTION**	**EMISSION LIMIT**	**UNIT**	**CASE-BY-CASE BASIS**
NY-0103	CRICKET VALLEY ENERGY CENTER	Black start generator	ultra low sulfur diesel	3000	KW	Generator equipped with selective catalytic reduction. Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	2.11	G/BHP-H	LAER
*PA-0292	ML 35 LLC/PHILA CYBERCENTER	DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS	#2 Oil	0		SCR	0.67	GRAMS/KW-H	OTHER CASE-BY-CASE
CA-1219	CITY OF SAN DIEGO PUD (PUMP STATION 1)	IC engine	diesel	2722	bhp	Tier 2 certified engine and 50 hr/yr for M&T	4	G/B-HP-H	OTHER CASE-BY-CASE
*PA-0282	JOHNSON MATTHEY INC/CATALYTIC SYSTEMS DIV	650-KW BACKUP DIESEL GENERATOR	Diesel / #2 Oil	45.8	GAL/H		6.9	G/HP-H	OTHER CASE-BY-CASE
MA-0043	MIT CENTRAL UTILITY PLANT	Cold Start Engine	ULSD	19.04	MMBTU/HR		35.09	LB/HR	OTHER CASE-BY-CASE

TABLE 1A - CO RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel)									
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
IN-0173	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.6	G/BHP-H	BACT-PSD
NY-0103	CRICKET VALLEY ENERGY CENTER	Black start generator	ultra low sulfur diesel	3,000	KW	Compliance demonstrated with vendor emission certification and adherence to vendor-specified maintenance recommendations.	2.6	G/BHP-H	BACT-PSD
IN-0180	MIDWEST FERTILIZER CORPORATION	RAW WATER PUMP	DIESEL, NO. 2	500	HP	GOOD COMBUSTION PRACTICES	2.6	G/B-HP-H	BACT-PSD
TX-0915	UNIT 5	DIESEL GENERATOR	DIESEL	0		LIMITED 500 HR/YR OPERATION	2.61	G/HPHR	BACT-PSD
*AK-0085	GAS TREATMENT PLANT	One (1) Black Start Generator Engine	ULSD	186.6	gph	Oxidation Catalyst, Good Combustion Practices, and 500 hour limit per year.	3.3	G/HP-HR	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system, positive crankcase ventilation, turbocharger with aftercooler, and high pressure fuel injection with aftercooler.	1.98	G/KW-H	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Main Propulsion Engines - C.R. Luigs	Diesel	5,875	hp	Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, and additional enhanced work practice standards including an engine performance management system and the Diesel Engines with Turbochargers measurement system, positive crankcase ventilation, turbocharger and aftercooler, and high pressure fuel injection with aftercooler.	2.42	G/KW-H	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Main Propulsion Generator Diesel Engines	Diesel	9,910	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engines and with turbocharger, aftercooler, and high injection pressure	0.8	G/KW-H	BACT-PSD
AK-0076	POINT THOMSON PRODUCTION FACILITY	Combustion of Diesel by ICEs	ULSD	1,750	kW		3.5	G/KW-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Airstrip Generator Engine	Ultra Low Sulfur Diesel	490	hp		2.6	GRAMS/HP-H	BACT-PSD
AK-0082	POINT THOMSON PRODUCTION FACILITY	Bulk Tank Generator Engines	Ultra Low Sulfur Diesel	891	hp		2.6	GRAMS/HP-H	BACT-PSD
*KS-0036	WESTAR ENERGY - EMPORIA ENERGY CENTER	Caterpillar C18DITA Diesel Engine Generator	No. 2 Distillate Fuel Oil	900	BHP	utilize efficient combustion/design technology	1.8	LB/HR	BACT-PSD

TABLE 1A - CO RBLC Search Data for Internal Non-Emergency Combustion Engines > 500 BHP (Section 17.110 - Diesel]									
RBLCID	FACILITY NAME	PROCESS NAME	PRIMARY FUEL	THROUGHPUT	UNIT	CONTROL METHOD DESCRIPTION	EMISSION LIMIT	UNIT	CASE-BY-CASE BASIS
AK-0076	POINT THOMSON PRODUCTION FACILITY	Combustion of Diesel	ULSD	7,520	kW	SCR is a post-combustion gas treatment technique for reduction of nitric oxide (NO) and nitrogen dioxide (NO2) in the turbine exhaust stream to molecular nitrogen, water, and oxygen. This process is accomplished by using ammonia (NH3) as a reducing agent, and is injected into the flue gas upstream of the catalyst bed. By lowering the activation energy of the NOX decomposition removal efficiency of 80 to 90 percent are achievable.	5	PPMV	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Cementing and Nitrogen Pump Diesel Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, positive crankcase ventilation, turbocharger, and high pressure fuel injection with aftercooler	3.73	T/12MO ROLLING TOTAL	BACT-PSD
OH-0383	PETMIN USA INCORPORATED	Black Start Generator (P007)	Diesel fuel	158	HP	Tier IV engine Good combustion practices	0.0644	T/YR	BACT-PSD
FL-0338	SAKE PROSPECT DRILLING PROJECT	Wireline Unit Diesel Engines - Development Driller 1	Diesel	0		Use of good combustion practices based on the current manufacturerâ€™s specifications for these engines, use of low sulfur diesel fuel, turbocharger with aftercooler, high pressure fuel injection with aftercooler	2.9	TONS	BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Water Blasting Diesel Engine	Diesel	208	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Well Evaluation Diesel Engine	Diesel	140	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine	0		BACT-PSD
FL-0347	ANADARKO PETROLEUM CORPORATION - EGOM	Fast Rescue Craft Diesel Engine	Diesel	230	hp	Use of good combustion practices based on the most recent manufacturer's specifications issued for engine and with turbocharger, aftercooler, and high injection pressure	0		BACT-PSD
LA-0307	MAGNOLIA LNG FACILITY	Diesel Engines	Diesel	0		good combustion practices, Use ultra low sulfur diesel, and comply with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0323	MONSANTO LULING PLANT	Standby Generator No. 9 Engine	Diesel Fuel	400	hp	Proper operation and limits on hours of operation for emergency engines and compliance with 40 CFR 60 Subpart IIII	0		BACT-PSD
LA-0318	FLOPAM FACILITY	Diesel Engines		0		Complying with 40 CFR 60 Subpart IIII	0		BACT-PSD
*PA-0292	ML 35 LLC/PHILA CYBERCENTER	DIESEL GENERATOR (2.25 MW EACH) - 5 UNITS	#2 Oil	0		CO Oxidation Catalyst	3.5	GRAMS/KW-H	OTHER CASE-BY-CASE
MA-0043	MIT CENTRAL UTILITY PLANT	Cold Start Engine	ULSD	19.04	MMBTU/HR		2.2	LB/HR	OTHER CASE-BY-CASE

Appendix D
Off-Property Impacts Analyses in Support of Minor New Source

Air Quality Analysis
In Support of a Minor New Source Permit Application

Texas GulfLink, LLC
Texas GulfLink Project
Brazoria County, Texas

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April 2022

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1.0 PROJECT OVERVIEW

Texas GulfLink, LLC (TGL) plans to develop the Texas GulfLink Deepwater Crude Export Terminal project (Project), a proposed deepwater crude oil export terminal, located near Freeport, Texas, off the coast of Brazoria County. The completed facility will be capable of loading Very Large Crude Carrier (VLCC) vessels for the purpose of exporting crude oil to international markets. When the Project is implemented, a reduction in emissions will be realized because the deepwater port will eliminate emissions associated with the reverse lightering approach currently used to load VLCCs.

TGL will construct a Deepwater Port near Freeport, Texas, capable of loading deep draft VLCC vessels. Crude oil from across the US (but primarily along the US Gulf Coast) will be gathered and stored at TGL's onshore tank terminal. Crude from the tank terminal will be transferred via a 42-inch pipeline offshore to the deepwater port, specifically to two (2) floating Single Point Mooring (SPM) buoys positioned approximately 32.5 nautical miles (45 miles) offshore. VLCCs will moor to the SPM buoys and be loaded with up to two (2) million barrels of crude oil each for transport to international markets. VOC vapors from VLCC loading will be controlled up to approximately 98% reduction using a vapor capture and processing module situated on board an Offshore Service Vessel (OSV) positioned alongside the VLCC the entire duration of loading. A manned offshore platform, equipped with round-the-clock port monitoring, custody transfer metering, and surge relief will provide assurance that shippers' commercial risks are mitigated and that the port is protected from security threats and environmental risks.

2.0 MODELING APPROACH

The proposed Project emissions for each regulated criteria pollutant are less than 250 tons per year (TPY); therefore, the entire Project is considered minor with respect to the federal Prevention of Significant Deterioration (PSD) program. Per Deepwater Port regulations, the proximity of the offshore facility to the nearest state dictates the air modeling approach. Because the Project will be located offshore closest to the state of Texas, the Texas Commission on Environmental Quality (TCEQ) APDG 6232 Air Quality Modeling Guidance was used as the basis for the required off-property impacts modeling. Because the Project is considered a minor new source, a Minor NSR air quality analysis was conducted. PSD-related analyses, such as Additional Impacts Analyses (Visibility, Soil and Vegetation, and Growth), Class I Area Impact Analysis, and Ozone Impact Analysis, were not performed because they did not apply.

The TCEQ's Minor NSR air quality analysis consists of the following components:

- State-National Ambient Air Quality Standards (NAAQS) analysis;
- State Property Line Standard (SPLS) analysis; and,
- Health Effects Analysis (HEA), also known as effects screening level (ESL) analysis.

State-NAAQS Analysis

The initial step of the state-NAAQS analysis (significant impact analysis) for a minor NSR project requires that project increases for all applicable criteria pollutants, i.e., carbon monoxide (CO), particulate matter greater than or equal to 10 microns in aerodynamic diameter (PM_{10}), particulate matter greater than or equal to 2.5 microns in diameter ($PM_{2.5}$), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2), be modeled using one year of the latest complete meteorological data. This step was performed and the results for each pollutant were compared to its respective significant impact level (SIL), as shown in Table 2-1. Note that Chapter 4 discusses the significant impact analysis and its results in more detail.

If a SIL is exceeded, then a cumulative impact analysis must be performed for the pollutant. A cumulative impacts analysis requires that allowable emissions of the pollutant from all Project sources and emissions from offsite sources within 50 kilometers be included in the model. The result of the modeled analysis is added to the background concentration for the pollutant and compared to the pollutant's state-NAAQS. Table 2-1 also lists applicable state-NAAQS and significant monitoring concentrations (SMC) for each pollutant. Chapter 5 of this report further discusses the cumulative impact analysis.

Table 2-1. Applicable SIL and State-NAAQS

Pollutant	Averaging Period	SIL ($\mu g/m^3$)	SMC ($\mu g/m^3$)	State-NAAQS ($\mu g/m^3$)
CO	1-hour	2,000	-	40,000
	8-hour	500	575	10,000
NO_2	1-hour	7.5	-	188
	Annual	1	14	100
PM_{10}	24-hour	5	10	150
	Annual	1	-	-
$PM_{2.5}$	24-hour	1.2	-	35
	Annual	0.2	-	12
SO_2	1-hour	7.8	-	196
	3-hour	25	-	-
	24-hour	5	13	365
	Annual	1	-	80

State Property Line Standard (SPLS) Analysis

The TCEQ requires that any proposed project that emits the sulfur compounds of SO_2, hydrogen sulfide (H_2S), and/or sulfuric acid (H_2SO_4) demonstrate compliance with the state standard for the pollutant. Because the proposed Project emits both SO_2 and H_2S, the SPLS analysis was conducted, and the results were compared to the limits presented in Table 2-2. Chapter 6 discusses this analysis further.

Table 2-2. Applicable State Property Line Standards

Pollutant	Averaging Period	Standard ($\mu g/m^3$)
SO_2	30-minute	1,021
H_2S	30-minute	162

Health Effects Analysis (HEA)

The purpose of the HEA is to demonstrate that emissions of non-criteria pollutants will be protective of the public's health and welfare. For this analysis, TCEQ has developed a guidance document titled "Modeling and Effects Review Applicability: How to Determine the Scope of Modeling and Effects Review for Air Permits (MERA)" (MERA Guidance). Because the Project's proposed emissions include a number of non-criteria pollutants, the HEA was performed following the procedures provided in the MERA guidance. Chapter 7 discusses this analysis further.

Project-Affected Sources

For the modeling analysis, the estimated potential emissions from emission sources associated with the platform and loading operations were included. Estimated maximum hourly emissions from these sources were considered for the short-term averaging periods and average hourly emissions were considered for the annual averaging periods.

Project-related emission sources that were modeled include combustion sources from the loading platform and OSV (e.g. diesel and gas-fired generators, portal crane, and emergency-use equipment) and VLCC marine loading operations. Stack heights and other related modeling stack parameters are based on similar equipment that exist in the maritime industry. Proposed emergency equipment, including the firewater pump engine, will be permitted to operate less than 100 hours per year. Because the engine will only be tested less than one hour in any 24-hour period, the engine was modeled based on the annual average rate instead of the short-term maximum hourly rate. This is in accordance with the 2018 BOEM Modeling Guidance and United States Environmental Protection Agency's (US EPA) guidance for intermittent sources[1].

[1] Memorandum, Additional Clarification regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard, March 1, 2011.

3.0 MODELING METHODOLOGY

3.1 OCD Model

Dispersion modeling was performed using the EPA's Offshore and Coastal Dispersion (OCD) model (Version 5.0, November 1997). This model simulates the effects of offshore emissions from point, area, or line sources on the air quality of coastal regions and is preferred for analyzing over-water pollutant transport. The OCD Model is the preferred model by the US EPA for performing modeling for offshore stationary sources.

3.2 Meteorological Data

The OCD model requires both over-land and over-water meteorological data. The following meteorological dataset has been pre-processed by BOEM in accordance with the Five-*Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico Region*[2] and used in the modeling analysis:

- OCD Group: 3a (i.e., northeastern portion of the Texas Gulf Coast)
- Buoy: 42035
- Surface data: Port Arthur National Weather Service (NWS) Station
- Upper-air data: Lake Charles NWS Station

This dataset was chosen based on the proximity of the surface stations to the Project. The proposed Project will be located nearer the Port Arthur, TX station than the Corpus Christi, TX station. The dataset includes buoy, onshore surface, and onshore upper-air sites pre-processed for OCD5 meteorological input data files. For the modeling analyses, the latest meteorological dataset (2004) was used.

3.3 Receptor Grid

A receptor grid was developed with a starting point for the receptors located at the ambient air boundary. Surrounding the platform and VLCCs on each SPM buoy will be safety zones (for a total of three (3) zones) to exclude and restrict non-Project vessel operations. The safety zones will each have a 500-meter radius. Fishing, anchoring, and transiting are not allowed in this area. A No Anchor Area (NAA) extends an additional 500-meter radius around the safety zones where no fishing or anchoring is allowed, and transiting is allowed only with permission when no tanker is on the SPM buoy or maneuvering. Per EPA, as a result of discussions on May 10, 2021, the ambient air boundary for TGL must be defined as the 500-meter safety zones around the SPM buoys and platform.

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[2] Five-Year Meteorological Datasets for CALMET/CALPUFF and OCD5 Modeling of the Gulf of Mexico Region, OCS Study, MMS 2008-029, New Orleans, July 2008.

Discrete receptors were placed at 100-meter intervals along the facility's ambient air boundary as described above. Additional receptors were placed at 100-meter intervals from the fence line out to 1 kilometer, 500-meter intervals from 1 kilometer out to 5 kilometers, and 1,000-meter intervals from 5 kilometers out to 9 kilometers. This receptor grid is sufficient to identify the location of the maximum off-property concentration for each modeled pollutant.

3.4 Terrain

The proposed Texas GulfLink Deepwater Port facility stationary emissions source will be located approximately 32 nautical miles off the coast of Texas in the Gulf of Mexico. Receptors are located over water surrounding the offshore facility. Therefore, the entire modeling domain is located completely over water in the Gulf of Mexico. According to US EPA and BOEM modeling guidance, overwater and shoreline is considered flat terrain. Therefore, the elevations for receptors were set to zero height for the modeling analysis.

3.5 Building Downwash

Building downwash accounts for the effects of nearby structures on the flow of emissions from their respective release structures. For this modeling analysis, typical platform building heights and dimensions were input. Base elevations for the platform's buildings were assumed the height of the platform above the water.

4.0 SIGNIFICANT IMPACT ANALYSIS

Screening runs were conducted to determine whether the net emission increases of all criteria pollutants could cause a significant impact and whether pre-construction monitoring would be required. Appendix A contains the location of the electronic modeling files generated for this analysis.

In the significant impact analysis, the project emissions were evaluated to determine whether they have the potential for a significant impact. The project emissions for the appropriate averaging periods were modeled and compared to the pollutants' respective SILs. Table 4-1 lists the modeled sources with their stack parameters. Table 4-2 lists the modeled emission rates.

Per US EPA guidance, all predicted impacts for both the short-term (1-hour, 3-hour, 8-hour, and 24-hour) and long-term (annual) standards are reported as the highest-first-high (H1H) of the modeled concentrations predicted at each receptor based on the 2014 National Weather Service (NWS) overland meteorological data and buoy overwater meteorological data.

Table 4-1. Modeled Sources Parameters – Significant Impact Analysis

EPN	Model ID	Source	Lat	Long	Building Height (m)	Stack Height (m)	Stack Temp (K)	Stack Diam (m)	Stack Velocity (m/s)	Stack Degree	Elevation (m)	Building Width (m)
(P) G-1	G1	Generator 1	28.555	95.028	3	6.1	700	0.15	39.62	0	30	3.7
(P) G-2	G2	Generator 2	28.555	95.028	3	6.1	700	0.15	39.62	0	30	3.7
(P) C-1	C1	Crane 1	28.555	95.028	0	12.19	728	0.18	48.77	0	39	0
(P) FWP-1	FWP1	MSS - Emerg Firewater Pump Maintenance	28.555	95.028	0	6.1	746	0.16	72.85	0	21	0
(P) MSS-1	MSS1	MSS - Abrasive Blasting / Painting	28.555	95.028	0	1	298.15	0.0762	0.001	0	30	0
(OSV) GT-1	GT1	GT Generator 1	28.523	95.028	0	15	833.15	0.4572	32.59	0	30	0
(OSV) GT-2	GT2	GT Generator 2	28.523	95.028	0	15	833.15	0.4572	32.59	0	30	0
(OSV) EDG-1	EDG1	CAT 3516C - No. 1	28.523	95.028	0	6.1	723.05	0.4572	43.71	0	30	0
(OSV) EDG-3	EDG3	CAT 3512C - No. 1	28.523	95.028	0	6.1	726.65	0.4572	41.12	0	30	0

Table 4-2. Modeled Emission Rates – Significant Impact Analysis

EPN	Model ID	Source	PM_{10}		$PM_{2.5}$		SO_2		NO_x		CO
			(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)	(TPY)	(lb/hr)
(P) G-1	G1	Generator 1	0.159	0.697	0.159	0.697	0.006	0.026	4.960	21.724	2.785
(P) G-2	G2	Generator 2	0.159	0.697	0.159	0.697	0.006	0.026	4.960	21.724	2.785
(P) C-1	C1	Crane 1	0.140	0.612	0.140	0.612	0.005	0.023	2.585	11.323	2.445
(P) FWP-1	FWP1	MSS - Emerg Firewater Pump Maintenance [1]	0.001	0.006	0.001	0.006	0.00005	0.0002	0.024	0.106	0.023
(P) MSS-1	MSS1	MSS - Abrasive Blasting / Painting	0.015	0.064	0.002	0.010	--	--	--	--	--
(OSV) GT-1	GT1	GT Generator 1	0.300	1.314	0.300	1.314	0.245	0.187	3.479	8.162	2.647
(OSV) GT-2	GT2	GT Generator 2	0.300	1.314	0.300	1.314	0.135	0.187	3.479	8.162	2.647
(OSV) EDG-1	EDG1	CAT 3516C - No. 1	0.333	1.458	0.333	1.458	0.012	0.054	10.374	45.438	5.825
(OSV) EDG-3	EDG3	CAT 3512C - No. 1	0.047	0.205	0.047	0.205	0.002	0.008	1.461	6.401	0.821

NOTE:
[1] The short-term emission rates are annualized since this source is an intermittent source with operating rates <= 100 hours.

4.1 Significant Monitoring Concentrations (SMC)

The results of the preliminary analysis were compared to the applicable SMC. As described in the following paragraph and table, the results indicated no concentrations equal to or greater than the SMC for all applicable standards.

4.2 Modeling Results

The maximum concentrations predicted by the screening modeling runs for all modeled pollutants are shown in Table 4-1.

Table 4-3. Modeling Results – Significant Impact Analysis

Pollutant	Averaging Period	SIL (µg/m³)	SMC (µg/m³)	Maximum Modeled Concentration [1] (µg/m³)
NO_2 [2]	1-hr	7.5	-	49.32
	Annual	1	14	0.98
PM_{10}	24-hr	5	10	0.54
	Annual	1	-	0.04
$PM_{2.5}$	24-hr	1.2	-	0.51
	Annual	0.2	-	0.04
SO_2	1-hr	7.8	-	0.35
	3-hr	25	-	0.26
	24-hr	5	13	0.1
	Annual	1	-	0
CO	1-hr	2000	-	29.84
	8-hr	500	575	16.62

NOTES:
[1] Results shown are highest-first-high (H1H).
[2] A 100% conversion from NO_x to NO_2 was assumed.

The modeling result for the 1-hour NO_2 indicates that the maximum off-site concentration was above the SIL. Therefore, a cumulative impact analysis for 1-hour NO_2 was required. The results for other pollutants show that they were all below their respective SILs, thus no further analysis was required for them. The results also show that none of the SMCs was exceeded, thus preconstruction monitoring is not required for any pollutant.

5.0 CUMULATIVE IMPACT ANALYSIS

The intent of the cumulative impact analysis is to determine if the proposed project causes or contributes to a violation of the state-NAAQS. For the 1-hour NO_2 requiring a state-NAAQS analysis, the form of the standard is given in the table below:

Table 5-1. Form of 1-hour NO_2 State-NAAQS Analysis

Pollutant	Averaging Period	Form of the State-NAAQS
NO_2	1-Hour	98^{th} Percentile of the 1-hour daily maximum concentrations, averaged over 3 years

The OCD model does not have the capability of calculating the 98-percentile of the 1-hour daily maximum concentrations of NO_2. Therefore, a post-processor program was written to calculate these values from the 1-hour OCD model results. In addition, as a result of discussions with EPA on May 10, 2021, the Ambient Air Ratio (ARM) method was allowed using a ratio of 0.9 applied to the results of the 1-hour NO_2 concentrations for the cumulative analysis to account for the conversion of NO_x to NO_2. However, as a conservative measure, the results summarized in this report for the 1-hour and annual NO_x analyses represent a 1-hour maximum concentration and the Tier 1 full conversion of NO_x to NO_2 without utilization of the post-processor due to the size of the output files required to utilize the post-processor. Appendix A contains the location of the electronic modeling files for this analysis.

5.1 Offsite Emissions Sources

For the cumulative impact analysis, off-site emission sources within 50 kilometers of the facility were included with the facility sources modeled in the significant impact analysis. These offsite sources were obtained from the 2014 BOEM Gulf-wide Emission Inventory. In addition, per conversation with EPA Region 6 on April 9, 2021, the Enterprise Products' Sea Port Oil Terminal (SPOT) project, which is proposed to be located approximately 7 statute miles from the Texas GulfLink project and whose permit application was deemed administratively complete on March 1, 2019, was required to be included in the cumulative impact analysis. Table 5-2 lists the off-site sources included in the model.

Table 5-2. Off-Site Sources – Cumulative Impact Analysis

Model ID	Source	Lat	Long	Building Height (m)	Stack Height (m)	Stack Temp (K)	Stack Diam (m)	Stack Velocity (m/s)	Stack Degree	Elevation (m)	Building Width (m)	NO_x 1-hr Emission (g/s)
2222_1	Boiler – Max MMBTU/hr < 10 – natural gas	28.160	94.740	0	24.38	478	0.300	2.81	0	0	0	0.0054
2222_2	Diesel Engine – Max HP < 600 – diesel	28.160	94.740	0	24.38	755	0.150	11.01	0	0	0	0.2741
2222_3	Natural Gas Engine – 4-stroke, rich-burn	28.160	94.740	0	24.38	866	0.150	18.35	0	0	0	0.4054
2428	Diesel Engine – Max HP < 600 – diesel	28.190	94.760	0	24.38	755	0.150	11.01	0	0	0	0.2741
PC_1	SPOT Terminal Services LLC	28.474	95.123	0	56.39	738.71	0.150	13.72	0	0	0	0.0491
PC_2	SPOT Terminal Services LLC	28.474	95.123	0	56.39	738.71	0.150	13.72	0	0	0	0.0491
DGEN_1	SPOT Terminal Services LLC	28.474	95.123	0	35.97	634.82	0.300	43.59	0	0	0	2.5993
DGEN_2	SPOT Terminal Services LLC	28.474	95.123	0	35.97	634.82	0.300	43.59	0	0	0	2.5993
EDGEN	SPOT Terminal Services LLC	28.474	95.123	0	47.24	588.15	0.200	24.08	0	0	0	0.0101
DFP_1	SPOT Terminal Services LLC	28.474	95.123	0	34.14	599.82	0.200	44.5	0	0	0	0.0164
DFP_2	SPOT Terminal Services LLC	28.474	95.123	0	34.14	599.82	0.200	44.5	0	0	0	0.0164
VC_1	SPOT Terminal Services LLC	28.474	95.123	0	56.39	922.04	3.050	18.9	0	0	0	4.7337
VC_2	SPOT Terminal Services LLC	28.474	95.123	0	56.39	922.04	3.050	18.9	0	0	0	4.7337
VC_3	SPOT Terminal Services LLC	28.474	95.123	0	56.39	922.04	3.050	18.9	0	0	0	4.7337
2222_1	SPOT Terminal Services LLC	28.160	94.740	0	24.38	478	0.300	2.81	0	0	0	0.0054

5.2 Background Air Quality Data

In addition to the permitted off-site inventory of emission sources, background concentrations from a representative monitor were incorporated into the modeled concentrations to determine total pollutant concentrations for comparison to the state-NAAQS.

Ambient air concentrations were obtained from the monitoring station as shown below in Table 5-3. The resulting concentration from the modeling runs were compared to the state-NAAQS for each averaging period.

Table 5-3. Ambient Air Quality Monitoring Sites

Pollutant	Name of Monitoring Site	Air Quality System (AQS) Code
NO_2	Lake Jackson	48-039-1016

Monitoring data were used to establish background concentrations required for the state-NAAQS analysis. Site-specific ambient air monitoring data were not available. Therefore, US EPA's AirData system was used to obtain background ambient concentrations of affected pollutants. This data were taken from the US EPA monitoring data website at: https://www.epa.gov/air-data. Because a cumulative impact analysis was required for NO_2 (1-hour and annual averages), existing monitoring data from the Lake Jackson, TX air monitoring facility was used.

The monitors chosen were reviewed for sufficient data to meet the completeness criteria. A year meets the completeness criteria if at least 75% of the scheduled samples per quarter were reported. The most recent and complete three consecutive available years (2016-2018) for 1-hour NO_2 were analyzed. Information on the monitoring stations used is shown in Table 5-4 below.

Per the TCEQ Guidelines, "The purpose of the representative background monitoring concentrations is to account for sources not explicitly modeled in an air dispersion modeling analysis." As the proposed Project will be located approximately 32 nautical miles off the Brazoria County coast, available monitors in and near Galveston, TX were considered for use. An evaluation of the nearby monitors was conducted to ensure that each monitor yields conservative background concentration data. The proposed Project will be located in open waters with the nearest platforms over 50 kilometers (31 miles) away. Any onshore monitor located near commercial or industrial areas will record higher concentrations than a monitor located offshore. Therefore, the background concentration obtained from the Lake Jackson monitoring station yields a conservatively high background concentration to represent offshore.

The nearest monitor to the proposed Project with NO_2 data is Lake Jackson (AQS Site ID: 48-039-1016) in Brazoria County, TX. This station is located west of the city of Lake Jackson and northwest of the city of Freeport. The Lake Jackson monitor location is adjacent to Highway 2004 near the intersection of Highway 332. This monitor is located within a half mile of a large commercial shopping area and approximately 1 mile from the Nolan Ryan Expressway (Hwy 288), which is a heavily traveled thoroughfare between Houston and Freeport. The influences of these nearby highways and population centers to the Lake Jackson monitor are considered relatively much greater than the influences of the proposed Texas GulfLink facility to the 2 existing platforms located over 30 miles from the facility. Therefore, use of concentration data from the Lake Jackson monitor for the project offshore modeling is deemed conservative and appropriate.

Table 5-4. Background Monitoring Data

Compound	Monitor Name	AQS Code	Year [1]	Percent Valid Data				Value Rank	Concentration		3-Year Average Concentration
				Q1	Q2	Q3	Q4				
NO_2	Lake Jackson	48-039-1016	2016	93%	90%	94%	94%	98th Percentile 1-Hour	35.8	µg/m^3	35.2 µg/m^3
			2017	94%	96%	80%	91%		35.6	µg/m^3	
			2018	96%	94%	95%	82%		34.2	µg/m^3	

NOTES:
[1] The background monitor data for 2019 1-hour NO_2 were below the 75% completeness threshold for the 2nd and 3rd quarters; therefore, the latest most-complete consecutive 3-year data for the 1-hour NO_2 were from 2016 – 2018.

5.3 NO_2 NAAQS Comparison

The result of the 1-hour NO_2 NAAQS analysis, which includes the background NO_2 concentration, is shown in Table 5-5 below. The result shows that the total concentration is below the standard.

Table 5-5. Modeling Results – Cumulative Impact Analysis

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	Background Concentration (ug/m^3)	Total Concentration (ug/m^3)	1-Hour NO_2 NAAQS (ug/m^3)
NO_2	2004	1-Hour	64.52	35.2	99.72	188

6.0 STATE PROPERTY LINE ANALYSIS

The TCEQ requires that any proposed project that emits SO_2, H_2S, and/or H_2SO_4 demonstrate compliance with the state standards for these pollutants. Because the proposed Project emits both SO_2 and H_2S, the SPLS analysis was conducted. Table 6-1 below lists the emission sources that emit these two (2) pollutants and the modeled emission rates, and Table 6-2 describes the results of the modeling analysis. Appendix A contains the location of the electronic modeling files generated for this analysis.

Table 6-1. Modeled Sources Parameters and Emissions Rates – State Property Line Standard Analysis

EPN	Model ID	Source	Lat	Long	Building Height (m)	Stack Height (m)	Stack Temp (K)	Stack Diam (m)	Stack Velocity (m/s)	Stack Degree	Elevation (m)	Building Width (m)	SO_2 Emission (lb/hr)	H_2S Emission (lb/hr)
(P) M-1	M1	Marine Loading	28.527	95.028	0	20	298	0.91	10.8	0	0	0		2.538E-03
(P) G-1	G1	Generator 1	28.555	95.028	3	6.1	700	0.15	39.62	0	30	3.7	0.006	
(P) G-2	G2	Generator 2	28.555	95.028	3	6.1	700	0.15	39.62	0	30	3.7	0.006	
(P) C-1	C1	Crane 1	28.555	95.028	0	12.19	728	0.18	48.77	0	39	0	0.005	
(P) FWP-1	FWP1	MSS - Emerg Firewater Pump Maintenance	28.555	95.028	0	6.1	746	0.16	72.85	0	21	0	0.00005	
(OSV) GT-1	GT1	GT Generator 1	28.523	95.028	0	15	833.15	0.4572	32.59	0	30	0	0.245	
(OSV) GT-2	GT2	GT Generator 2	28.523	95.028	0	15	833.15	0.4572	32.59	0	30	0	0.135	
(OSV) EDG-1	EDG1	CAT 3516C - No. 1	28.523	95.028	0	6.1	723.05	0.4572	43.71	0	30	0	0.012	
(OSV) EDG-3	EDG3	CAT 3512C - No. 1	28.523	95.028	0	6.1	726.65	0.4572	41.12	0	30	0	0.002	
(OSV) UM-1	UM1	Uncontrolled Marine Loading (Bad Weather)	28.554	95.028	0	20	298	0.91	10.8	0	0	0		9.027E-02
(OSV) F-1	F1	OSV Fugitive Emissions	28.554	95.028	0	1	298	0.0762	0.001	0	0	0		1.377E-07
(OSV) F-2	F2	OSV Fugitive Emissions - Hose Disconnects	28.554	95.028	0	1	298	0.0762	0.001	0	0	0		4.439E-08

Table 6-2. Modeling Results – State Property Line Standard Analysis

Pollutant	Meteorological Year	Averaging Period	Modeled Concentration (ug/m^3)	State Property Line Standard (ug/m^3) [2]
SO_2	2004	30-minute[1]	0.35	1,021
H_2S	2004	30-minute[1]	0.59	162

NOTES:
[1] Per TCEQ guidance, use the highest-first-high (H1H) predicted concentrations for the one hour averaging times.
[2] State property line standard from TCEQ Air Quality Modeling Guidelines (APDG 6232 v4, revised 9/2018), Appendix B Table B-3.

7.0 HEALTH EFFECTS ANALYSIS

Emissions from the platform and VLCC loading of speciated pollutants with an ESL listed in the TCEQ's Toxicity Factor Database were evaluated in this analysis. VOC emissions from the VLCC will be captured and routed to a vapor processing module onboard the adjacent OSV. Speciated emissions on the platform are from combustion sources, fugitives, pigging, and a small surge tank. Additionally, emissions from the OSV will be generated by gas turbines, diesel generator engines, and fugitives. The speciated pollutants include the following:

- 1,3-Butadiene (CAS Number: 106-99-0)
- 2,2,4-Trimethylpentane (isooctane) (540-84-1)
- Acetaldehyde (75-07-0)
- Acrolein (107-02-8)
- Benzene (71-43-2)
- Ethylbenzene (100-41-4)
- Formaldehyde (50-00-0)
- n-Hexane (110-54-3)
- Isopropyl benzene (98-82-8)
- Naphthalene (91-20-3)
- Poly Aromatic Hydrocarbons (PAH) (130498-29-2)
- Propylene Oxide (75-56-9)
- Toluene (108-88-3)
- m-Xylene (108-38-3)

Following TCEQ's MERA Guidance (attached in Appendix B), it was determined that only benzene was required to undergo site-wide modeling as the other pollutants evaluated were screened out of that requirement. Appendix C describes the analysis in a step-by-step procedure as described in the MERA Guidance.

The modeled sources, parameters, and emission rates for the benzene modeling analysis are presented in Table 7-1. The results are listed in Table 7-2 and compared to the appropriate ESLs. As shown, both modeled maximum ground level concentrations (GLC_{max}) are below their respective ESLs. Appendix A contains the location of the electronic modeling files generated for this analysis.

Table 7-1. Modeled Sources Parameters and Emissions Rates – Health Effects Analysis

EPN	Model ID	Source	Lat	Long	Building Height (m)	Stack Height (m)	Stack Temp (K)	Stack Diam (m)	Stack Velocity (m/s)	Stack Degree	Elevation (m)	Building Width (m)	Benzene Emission (lb/hr)
(P) M-1	M1	Marine Loading	28.527	95.028	0	20	298	0.91	10.8	0	0	0	0.447
(P) G-1	G1	Generator 1	28.555	95.028	3	6.1	700	0.15	39.62	0	30	3.7	0.005
(P) G-2	G2	Generator 2	28.555	95.028	3	6.1	700	0.15	39.62	0	30	3.7	0.005
(P) T-1	T1	Surge Tank	28.555	95.028	10	10.89	298	0.100584	0.001	0	30	6.096	0.002
(P) P-1	P1	MSS - Pigging Operations	28.555	95.028	0	1	298	1.372	0.001	0	30	0	0.370
(P) F-1	F1	Platform Fugitive Emissions	28.555	95.028	0	1	298	0.076	0.001	0	30	0	0.0002
(OSV) UM-1	UM1	Uncontrolled Marine Loading (Bad Weather)	28.554	95.028	0	20	298	0.91	10.8	0	0	0	15.888
(OSV) GT-1	GT1	GT Generator 1	28.523	95.028	0	15	833.15	0.4572	32.59	0	30	0	0.001
(OSV) GT-2	GT2	GT Generator 2	28.523	95.028	0	15	833.15	0.4572	32.59	0	30	0	0.001
(OSV) EDG-1	EDG1	CAT 3516C - No. 1	28.523	95.028	0	6.1	723.05	0.4572	43.71	0	30	0	0.005
(OSV) EDG-3	EDG3	CAT 3512C - No. 1	28.523	95.028	0	6.1	726.65	0.4572	41.12	0	30	0	0.001
(OSV) F-1	F1	OSV Fugitive Emissions	28.554	95.028	0	1	298	0.0762	0.001	0	0	0	0.0001
(OSV) F-2	F2	OSV Fugitive Emissions - Hose Disconnects	28.554	95.028	0	1	298	0.0762	0.001	0	0	0	0.002

Table 7-2. Modeling Results – Health Effects Analysis

Pollutant	Meteorological Year	Averaging Period	Maximum Ground Level Concentration (GLCmax) [1] (ug/m^3)	ESL Standard (ug/m^3)
Benzene	2004	1-hour	108.68	170
Benzene	2004	Annual	0.04	4.5

NOTE:
[1]The receptors in the model are industrial receptors over water.

8.0 $PM_{2.5}$ SECONDARY FORMATION

As part of the assessment of off-site impacts from $PM_{2.5}$, secondary formation of $PM_{2.5}$ attributed to emissions of SO_2 and NO_x must be addressed. The US EPA has developed a method to estimate single source impacts of secondary pollutants as a Tier 1 approach. This assessment is contained in the US EPA's guidance document on modeling using the MERPs approach[3]. The guidance uses existing empirical relationships between precursors and secondary impacts. A MERP is defined as an emission rate of a precursor that is expected to result in a change in the ambient ozone or $PM_{2.5}$ that would be less than a specific air quality concentration threshold for ozone or $PM_{2.5}$. MERPs for each precursor may be based on either the most conservative (lowest) values across a region/area or the source-specific value derived from a more similar hypothetical source modeled by a permit applicant, permitting authority, or US EPA.

Proposed project emissions of SO_2 and NO_2 are 0.51 TPY and 123.04 TPY, respectively. These values were compared to *Table 4.1 Lowest, median, and highest illustrative MERP values (tons per year) by precursor, pollutant and climate zone* of the US EPA's guidance document. For the South, the lowest SO_2 and NO_x MERP values for daily PM are 274 TPY and 1,881 TPY, respectively. As evident, both SO_2 and NO_x emissions from the proposed Texas GulfLink Project are significantly below this value. Therefore, air quality impacts of $PM_{2.5}$ from SO_2 and NO_x would be expected to be below the critical air quality concentration (CAC) threshold.

In addition, calculating a source-specific value derived from a more similar hypothetical source modeled by EPA[4] shows that the impacts from the precursors are minimal:

Hypothetical source for SO_2 and NO_x: Harris County, Texas, 10-meter stack, 500 TPY

24-hour $PM_{2.5}$:
Maximum Concentration for SO_2 = 1.56 μg/m^3
Maximum Concentration for NO_x = 0.114 μg/m^3
Secondary 24-hr $PM_{2.5}$ from precursors =
(0.51 TPY SO_2/500 TPY SO_2) x 1.56 μg/m^3 + (123.04 TPY NO_x/500 TPY NO_x) x 0.114 μg/m^3 = 0.0296 μg/m^3

Annual $PM_{2.5}$:
Maximum Concentration for SO_2 = 0.039 μg/m^3
Maximum Concentration for NO_x = 0.009 μg/m^3
Secondary 24-hr $PM_{2.5}$ from precursors =
(0.51 TPY SO_2/500 TPY SO_2) x 0.039 μg/m^3 + (123.04 TPY NO_x/500 TPY NO_x) x 0.009 μg/m^3 = 0.0023 μg/m^3

[3] *Guidance on the Development of Modeled Emission Rates for Precursors (MERPs) as a Tier 1 Demonstration Tool for Ozone and $PM_{2.5}$ Under the PSD Permitting Program* (EPA-454/R-16-006, April 30, 2019)
[4] From MERPs View Qlik | US EPA

Adding these secondary concentrations to the modeled 24-hour and annual $PM_{2.5}$ concentrations listed in Table 4-3 in Section 4.2 of this report yield the following:

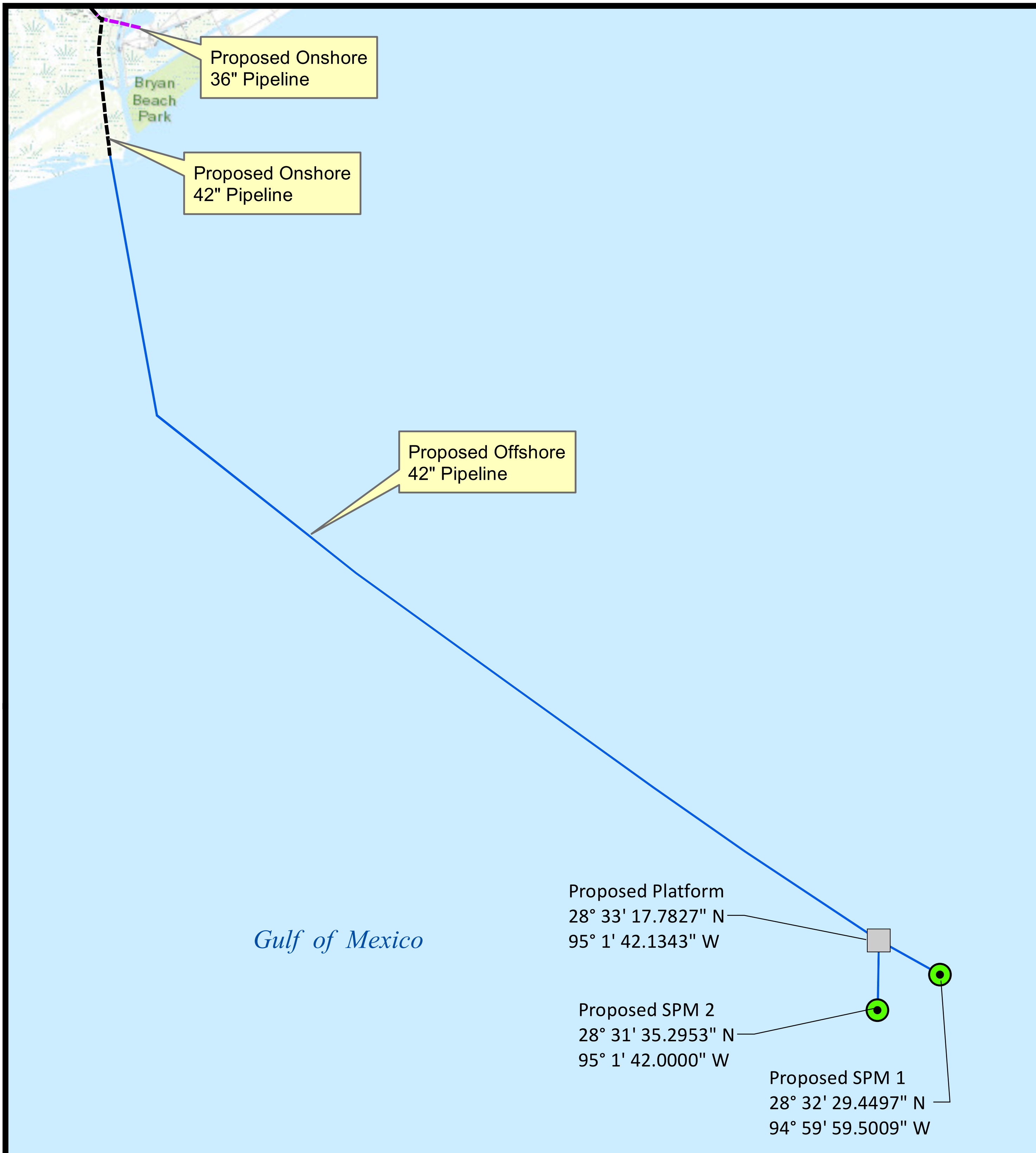
24-hour $PM_{2.5}$: 0.51 $\mu g/m^3$ + 0.0296 $\mu g/m^3$ = 0.5396 $\mu g/m^3$
Annual $PM_{2.5}$: 0.04 $\mu g/m^3$ + 0.0023 $\mu g/m^3$ = 0.0423 $\mu g/m^3$

The results show that both concentrations are below their respective SILs. This analysis demonstrates that the total $PM_{2.5}$ impacts (primary and precursor) are below the CAC.

FIGURES

Figure 1

Offshore Site Location Map



- For permitting purposes only.

Texas GulfLink, LLC
Dallas, Texas

Texas GulfLink

Offshore Location Map

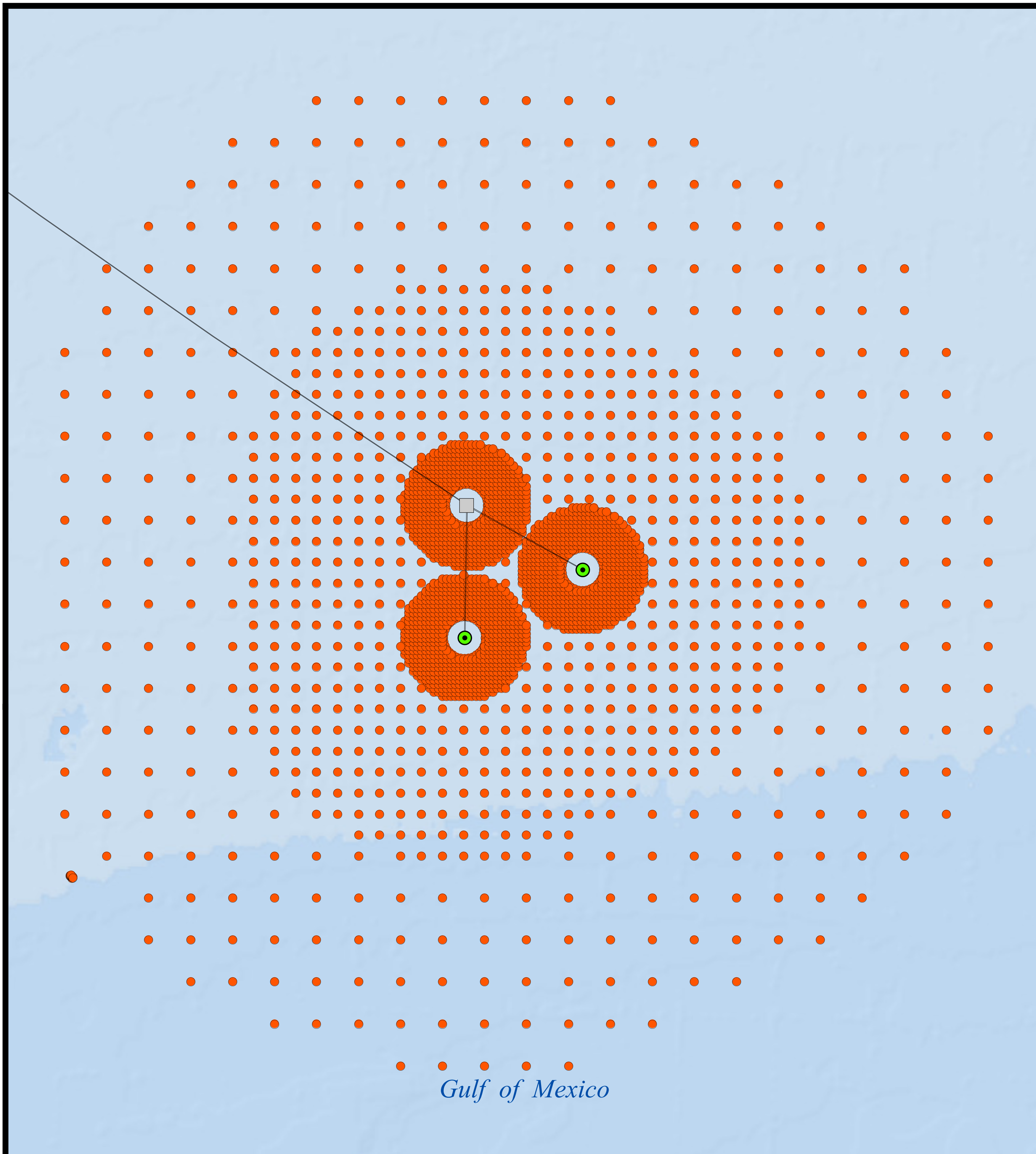
N

0 3
Miles

Drawn:	CAL	Checked:	BLN
Date:	6/3/2021	Approved:	TEW
Dwg. No.:	A17073-36	**Figure 1**	

Figure 2

Receptor Locations



Receptor
Proposed SPM
Proposed Platform

Texas GulfLink, LLC
Dallas, Texas

Texas GulfLink

Receptor Grid

N

0 1
Miles

Drawn: CAL
Checked: MEH
Date: 6/3/2021
Approved: JLS
Dwg. No.: A17073-113

Figure 2

APPENDICES

Appendix A

Electronic Modeling Files

The OCD modeling input and output files were uploaded to TGL’s SharePoint site.

Appendix B

TCEQ MERA Guidance

Air Permit Reviewer Reference Guide

APDG 5874

Modeling and Effects Review Applicability (MERA)

Air Permits Division

Texas Commission on Environmental Quality

March 2018

Table of Contents

Introduction

The Texas Commission on Environmental Quality (TCEQ) regulates air quality in the state of Texas through the Texas Clean Air Act (TCAA), located in Chapter 382 of the Texas Health and Safety Code and rules, including those in Title 30 Texas Administrative Code (TAC) Chapter 116.

The TCEQ staff conducts a preconstruction technical review during the air permitting process. This review ensures that the operation of a proposed facility will comply with all the rules of the TCEQ and intent of the TCAA, and not cause or contribute to a condition of air pollution. A review of an air permit application involves an assessment of human health and welfare effects related to emissions from production and planned maintenance, startup, and shutdown (MSS) activities.

The human health and welfare effects are evaluated for applications with new and/or modified sources of air contaminants, as well as in permitting actions involving retrospective reviews or previously unevaluated emissions. Contaminants for which state air quality standards or National Ambient Air Quality Standards (NAAQS) exist are evaluated using a comparison between predicted concentrations and the standards. The evaluation procedures for these contaminants are covered in detail in the TCEQ Air Quality Modeling Guidelines – APDG 6232. If there are no state or national ambient air quality standards for a contaminant, it is evaluated through the TCEQ's Modeling and Effects Review Applicability (MERA) process. During the course of the MERA process, the scope of air dispersion modeling and effects review is determined.

While this document provides a general process and defines minimum considerations for agency staff's air quality impacts analysis, this document is not regulatory and does not limit the permit reviewer's ability to require the applicant to provide additional information. In addition, the permit reviewer and Air Permits Division (APD) management have the discretion to perform an effects review outside of the MERA process.

The MERA process begins with Step 0, which informs the user of the general procedures and practices to be followed throughout the MERA process. Steps 1 through 7 detail the criteria used to evaluate the health effects of an air contaminant. The initial steps in the MERA process are designed to be simple and conservative. As one progresses through the process, the steps require more detail and result in a more refined (less conservative) analysis. Site-wide air dispersion modeling is conducted at Step 7; and those results are evaluated using the Toxicology Effects Evaluation Procedure in Appendix D. If a contaminant, evaluated on a chemical species by chemical species basis, meets the criteria of a step, the review of human health and welfare effects is complete. A chemical species is said to "fall out" of the MERA process at this step, and the MERA document will direct the user to Step 8 to document the evaluation. If a contaminant does not meet the criteria of a step, the document will direct the user to the appropriate next step. It is acceptable to skip steps in the MERA process and proceed directly to more detailed steps.

This document replaces Modeling and Effects Review Applicability, APDG 5874, July 2009.

Summary of Significant Changes

Revision Date	Description of Changes
February 2018	Improve ease of use and clarity, removed infrequently used steps, and revised multi-point equation in previous Step 5. Chemical species for which there is not an ESL may be exempted from a MERA evaluation.
July 2009	Provided additional clarity pertaining to unevaluated and MSS emissions and added Appendix D, Toxicology Effects Evaluation Procedure.
August 2008	Updated requirements for APWL Constituents, added criteria for planned MSS and unevaluated emissions and added the term “permit-wide,” established magnitude and frequency criteria for planned MSS emissions.
October 2001	Removed special interest constituents, and replaced with Air Pollutant Watch List, corrected multi-point equation in Step 5, and added information about single property line designations.
August 1998	Updated flowchart, added requirements for constituents of special interest, and added effects evaluation procedures and updated the format.
July 1993	Original MERA Guidance Document

How to Determine the Scope of Modeling and Effects Review for Air Permits

Step 0: Applicability and Procedures

MERA Evaluation Applicability

A MERA evaluation must be conducted for all chemical species whose short-term or long-term allowable emission rate will increase from any emission point number (EPN) through the project. The change in an allowable emission rate is calculated as the difference between the proposed maximum allowable emission rate and the currently permitted maximum allowable emission rate. Throughout the remainder of this document “allowable emission rates” will be referred to as “emission rates” or “emissions.”

The following are exempt from a MERA evaluation:

- All chemical species for which there is a state air quality standard or NAAQS, other than particulate matter species that have an Effects Screening Level (ESL) published by the TCEQ Toxicology Division. The ESL database will reference the NAAQS in place of an ESL if a MERA evaluation is not required for a particulate matter species.
- The “Air Quality Modeling Guidelines” document (APDG 6232) provides the process for evaluating chemical species for which there is a state air quality standard or NAAQS.
- Facilities and chemical species listed on the Toxicology Emissions Screening List (see Appendix B).
- Chemical species for which there is not a current ESL listed in the Toxicity Factor Database, accessed through the Texas Air Monitoring Information System (TAMIS) database via the Toxicology ESL summary and detail reports. While no effects review is required, such chemical species must satisfy the BACT and other requirements. In addition, the permit reviewer and APD management have the discretion to perform an effects review outside of the MERA process. This exemption does not apply to chemical species being authorized under chemical flexibility permit provisions.

General Procedures

The following applies to the health effects review described in the MERA process, unless otherwise specified:

- The MERA evaluation must be conducted for each chemical species individually (except in cases where the Toxicology Division has developed an ESL for a blend such as gasoline), and must include all EPNs in the project with an increasing allowable emission rate of that chemical species.
- A short-term impacts evaluation must be conducted for all chemical species with an increase in short-term emissions.
- A long-term impacts evaluation must be conducted for chemical species with an increase in long-term emissions under the following conditions:
    - for all chemical species with a long-term ESL that is less than 10 percent of the short-term ESL or;
    - if a chemical species does not have an assigned short-term ESL, but does have an assigned long-term ESL; or

- if previous impacts were approved based on a limited frequency of exceedances.

For other cases, a long-term impacts is not required unless requested by the permit reviewer.

- The input of a screening model is an emission rate in mass per unit of time and the output is a maximum 1-hr ground level concentration (GLC_{max}), in units of micrograms per cubic meter (µg/m3). Therefore, if a long-term impacts evaluation is necessary and screen modeling is used, an annual GLC_{max} must be calculated by multiplying:
  - an annual unit impact multiplier, and
  - an emission rate representative of the annual emission increase associated with the 1-hr GLC_{max}.

  For SCREEN3, the annual unit impact multiplier is determined by multiplying the hourly unit impact multiplier by 0.08, which is an annual conversion factor that accounts for the variation in meteorological conditions throughout the year. For AERSCREEN the annual unit impact multiplier is determined by multiplying the hourly unit impact multiplier by the annual conversion factor 0.1. An annual conversion factor is not needed if a refined model that can calculate an annual GLC_{max} is used.

  To determine the emission rate representative of the annual emissions increase, convert the ton-per-year increase in emissions to a pound-per-hour rate using 8760 hours per year and 2000 pounds per ton.

  As an example, an emission source has an hourly unit impact multiplier of 100 µg/m^3, generated using SCREEN3, and an annual emission rate of 40 tpy. The annual emission rate is converted to an hourly rate as shown below:

  40 tpy x 2000 lb/ton / 8760 hours/year = 9.134 lb/hr

  The maximum 1-hr ground level concentration is multiplied by 0.08 to yield an annual unit impact multiplier:

  100 µg/m^3 x 0.08 = 8 µg/m^3

  The annual GLC_{max} is then calculated by multiplying that annual unit impact multiplier and that emission rate representative of the annual emissions:

  8 µg/m^3 x 9.134 pph = 73.1 µg/m^3

- ESLs should be determined from the Toxicity Factor Database, accessed through the TAMIS database. Instructions for using the database can be found on the Toxicology Division's website. If a chemical species does not have an assigned ESL, it may be exempted from a MERA effects evaluation, unless an evaluation is requested by the permit reviewer. However, for certain chemical species, such as chemicals to be approved under chemical flexibility permit provisions or proprietary mixtures, a new ESL may be requested from the Toxicology Division. In addition, a default ESL of 2 µg/m^3 may be used for a species with an unknown ESL.

- Unless otherwise stated, each step in the MERA evaluation must include all emissions associated with the project, including:
  - MSS emissions that will be authorized under Permits By Rule (PBRs).
  - Emissions from PBRs and Standard Permits (SPs) that are being consolidated by incorporation into the permit.

- Chemical species on the Air Pollutant Watch List (APWL) are subject to the requirements detailed in the "Permit Application Guidance for Companies Located in an Air Pollutant Watch List Area" guidance document, and must also be evaluated using the MERA. Also, a case-by-case analysis not relying on the steps of the MERA may be required for any specific situation as deemed appropriate by the permit reviewer and APD management.
- A retrospective MERA evaluation may be required for corrections in representations or emission calculations.This determination will be made on a case-by-case basis.
- All refined modeling should be conducted in accordance with direction from APD staff and the "Air Quality Modeling Guidelines" document (APDG 6232). A pre-modeling meeting or teleconference with the applicant, permit reviewer and modeling team is recommended before refined modeling is performed.

Step 1: No Net Increase

- Sum the proposed emission increases and decreases from each EPN to determine the net change in emissions.

Step 1: Is the net change in emissions less than or equal to zero?

- **If "Yes"** → Conduct a qualitative analysis to determine if the project will result in an increase in the GLC_{max} at the property line. The qualitative analysis should include factors affecting the GLC_{max} such as distance from the property line and the type of source (point, area, or volume). Submit the analysis as requested by the permit reviewer.

  Does the qualitative analysis indicate that the GLC_{max} will increase?

  - **If "No" → The MERA is complete. Proceed to Step 8 for documentation.**
  - **If "Yes" → Step 2.**
- **If "No" → Step 2**.

Step 2: De Minimis Increase

- Sum the short-term emission increases from each EPN to obtain the total short-term project increase. Do not include emission rate decreases from any EPN.
  - Include any unevaluated emissions such as emissions from PBRs, SPs, or any other authorization.
  - If MSS and production emissions occur simultaneously, add the MSS and production emissions into one emission rate. Otherwise, calculate separate rates.

Step 2: Is the long-term ESL ≥ 10 % of the short-term ESL?

AND

Are total short-term project increases less than the appropriate de minimis levels below?

If MSS and production emissions occur simultaneously, evaluate the combined emission rates against the production de minimis levels. Otherwise, evaluate MSS and production emissions separately against their respective de minimis levels.

Short-term ESL ($\mu g/m^3$)	Production Emissions Increase (lb/hr)	MSS Emissions Increase (lb/hr)
2 ≤ ESL < 500	≤ 0.04	≤ 0.1
500 ≤ ESL < 3500	≤ 0.1	
3500 ≤ ESL	≤ 0.4	≤0.4

- **If "Yes" → The MERA is complete. Proceed to Step 8 for documentation**.
- **If "No" → Step 3**.

Step 3: 10% of ESL Evaluation

- Evaluate emission increases in this step. Do not include emission decreases.
- For each EPN (EPN_i), obtain the unit impact multiplier (X_i), using either the Screening Tables found in Appendix C or an approved EPA model.
- Use the following equation to conservatively predict impacts from the project:

$$GLC_{max} = \sum_{i=1}^{n} (X_i * \mathrm{ER}_i)$$

where:

GLC_{max} = The maximum off-property ground level concentration for the appropriate averaging time of the chemical species emitted from all emission points in the impacts evaluation, in $\mu g/m^3$.

X_i = The unit impact multiplier obtained from the Screening Tables in Appendix C or an approved EPA Model for EPN_i, in $\mu g/m^3$ per lb/hr.

ER_i = The project emission rate increase of the chemical species being evaluated, from EPN_i in lb/hr.

n = The total number of emission points.

Step 3: Is the following inequality true?

$$\boldsymbol{GLC_{max} \leq 0.1 * ESL}$$

where:

ESL = The effects screening level for the appropriate averaging time, in $\mu g/m^3$ for the chemical species being evaluated.

- **If "Yes" → Step 8. The MERA is complete.**
- **If "No" → Step 4.**

Example:

EPN	Emission Rate Increase (lb/hr)	ESL (µg/m³)	Distance (feet)	Height (feet)	X Value (µg/m³ / lb/hr)
1	3	20,000	1000	10	252
2	10	20,000	4000	20	50

$$\sum_{i=1}^{n} (X_i * ER_i) \leq 0.1 * ESL$$

$$(X_1 * ER_1) + (X_2 * ER_2) \leq 0.1 * ESL$$

$$\left(252 \frac{\mu g/m^3}{lb/hr} * 3 \frac{lb}{hr}\right) + \left(50 \frac{\mu g/m^3}{lb/hr} * 10 \frac{lb}{hr}\right) \leq 0.1 * 20{,}000 \frac{\mu g}{m^3}$$

$$756 \frac{\mu g}{m^3} + 500 \frac{\mu g}{m^3} \leq 2{,}000 \frac{\mu g}{m^3}$$

$$1{,}256 \frac{\mu g}{m^3} \leq 2{,}000 \frac{\mu g}{m^3}$$

In this example, the chemical species evaluated falls out at Step 3 because the increase in total ground level concentration is less than 10% of the ESL.

Step 4: Project-wide Modeling

- Model the MSS and production emissions for the project. Determine a GLC_{max} for production emissions and a GLC_{max} for MSS emissions.
- Model the MSS and production emissions for the project combined with all new and increased emissions since the most recent sitewide modeling. Determine a GLC_{max} for production emissions and a GLC_{max} for MSS emissions.
- Do not include emission decreases.
- Historical modeling records may be used to determine GLC_{max} values for this step.

Step 4: Will the following thresholds be met at the location of the GLC_{max}?

Planned MSS Only	Production Only
GLC_{max} ≤50% ESL for the project and all new and increased planned MSS emissions since the most recent site-wide modeling **AND** GLC_{max} ≤25% ESL for the project	GLC_{max} ≤25% ESL for the project and all new and increased production emissions since the most recent site-wide modeling **AND** GLC_{max} ≤10% ESL for the project

- **If “Yes” for both Production and Planned MSS → Step 8. The MERA is complete.**
- **If “Yes” for Production and “No” for Planned MSS → The MERA is complete for production emissions. MSS emission must be evaluated in Step 5**.
- **If “No” for Production → Step 6**.

Step 5: MSS Evaluation

Step 5A: Is the chemical species one of the following?

- Acrolein
- Acrylonitrile
- Benzene
- Bromine
- 1,3-butadiene
- Carbon disulfide
- Chlorine
- Chloroform
- Epichlorohydrin
- Fluorine
- Formaldehyde
- Hydrochloric acid (HC)
- Hydrofluoric acid (HF)
- Hydrazine
- Mercaptans
- Methyl bromide
- Methylenediphenyl diisocyanate (MDI)
- Phosgene
- Phosphine
- Styrene (odor)
- Toluene diisocyanate (TDI)
- Any chemical species with a short-term ESL < 2 μg/m^3

- **If "Yes" → Step 6.**
- **If "No" → Step 5B.**

Step 5B: Will the planned MSS emissions meet all of the following thresholds for the corresponding column as shown below?

Ground Level Concentration (μg/m^3)	Exceedances per Year (λ)
GLC_{max} ≥ 1 × ESL	λ ≤ 24
GLC_{max} ≥ 2 × ESL	λ ≤ 12
GLC_{max} ≥ 4 × ESL	λ ≤ 6
GLC_{max} ≥ 10 × ESL	λ = 1
GLC_{max} > 20 × ESL	λ = 0

- **If "Yes" → The MERA is complete for the MSS emissions.**
- **If "No" → Step 6.**

Step 6: Ratio Test

- Sum the emission increases from the project to obtain the total project increase, including planned MSS and production increases. Do not include any emission decreases.
- Sum the currently authorized emissions and all previously unevaluated emission from all emission points on the site, along with the new and increased emissions from the project to obtain the proposed site-wide emissions.

Step 6: Is the following inequality true?

$$\frac{GLC_{max}}{ESL} \leq \frac{ER_P}{ER_S}$$

where:

GLC_{max} = The maximum ground level concentration for the appropriate averaging time, in μg/m^3.
ESL = The effects screening level for the appropriate averaging time, in μg/m^3.
ER_P = The project increase, in lb/hr or tpy.
ER_S = The proposed site-wide emissions, in lb/hr or tpy.

- **If "No" → Step 7.**
- **If "Yes" → Step 8. The MERA is complete.**

Step 7: Site-wide Modeling.

- Conduct site-wide modeling in accordance with ADMT guidance; or
- Update site-wide modeling from a recently approved project to include the project increase and any previously unevaluated emissions; or
- Submit monitoring data per ADMT guidance and demonstrate that the monitoring data are representative of near worst-case impacts and should be used instead of site-wide modeling. Contact the permit reviewer to arrange a meeting to discuss currently available monitoring data or to receive guidance for, and approval of, a strategy to collect monitoring data.
- Site-wide modeling applies to emissions from all emission points on properties identified in single property-line designations between multiple owners.

TCEQ staff will evaluate the modeling analysis to determine if it is appropriate to proceed to Step 8.

Step 8: Documentation

- Document the MERA evaluation and provide all supporting information. The appropriate TCEQ staff will review and evaluate the impacts analysis.

Appendix A: Glossary

Please note that there are often differences in term usage and term definitions between the state and federal regulatory agencies. However, when conducting a MERA evaluation with this document, please refer to the following definitions.

air contaminant—Particulate matter, radioactive materials, dust fumes, gas, mist, smoke, vapor, or odor, including any combination of those items, produced by processes other than natural (Texas Health and Safety Code (THSC) §382.003).

air dispersion model—A model of the dispersion and transport of contaminants in the atmosphere, used to estimate the ground level concentration resulting from the emission of a contaminant, as further described in the "Air Quality Modeling Guidelines" document (APDG 6232).

air pollution—The presence in the atmosphere of one or more air contaminants in such concentration and of such duration that are or tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or interfere with the normal use and enjoyment of animal life, vegetation, or property (THSC §382.003).

ambient air—The portion of the atmosphere, external to buildings, to which the general public has access (30 Texas Administrative Code (TAC) § 101.1). For purposes of the MERA, ambient air is all air outside the property line.

Air Pollutant Watch List (APWL)—A list of geographic areas for which ambient air quality monitoring data indicates persistent, elevated concentrations of toxic air contaminants. The list and its accompanying programs aim to reduce emissions of APWL contaminants by engaging stakeholders, notifying the public, and requiring additional scrutiny for air permit applications that propose increases of an APWL contaminant in an APWL area. This list was established and is maintained by the TCEQ in compliance with the Texas Health and Safety Code, Title 5, Subtitle C, Chapter 382.

authorization—A mechanism to allow the release of emissions of constituents into ambient air. Typical authorizations are PBRs, SPs, and case-by-case NSR Permits.

chemical species—An individual air contaminant with a specific effects screening level.

criteria pollutant—A pollutant for which a NAAQS has been defined.

Emission Point Number (EPN)—A unique identifier for a point of emission release into the ambient air.

Effects Screening Level (ESL)—Screening levels used in TCEQ's air permitting process to evaluate the predicted impacts of air dispersion modeling. They are used to evaluate the potential for effects to occur as a result of exposure to concentrations of contaminants in the air. ESLs are based on data concerning health effects, the potential for odors to be a nuisance, and effects on vegetation. They are not ambient air standards. If predicted airborne levels of a constituent do not exceed the screening level, adverse health or welfare effects are not expected. If predicted ambient levels of constituents in air exceed the screening levels, it does not necessarily indicate a problem but rather triggers a review in more depth.

facility—A discrete or identifiable structure, device, item, equipment, or enclosure that constitutes or contains a stationary source, including appurtenances other than emission control equipment. A mine, quarry, well test, or road is not considered to be a facility (THSC §382.003 and 30 TAC §116.10).

Ground Level Concentration (GLC)—The ground level concentration of a constituent in micrograms per cubic meter (µg/m3) as predicted by modeling or measured by monitoring.

GLC_{max}—Maximum off-property ground level concentration for the appropriate averaging time of the chemical species emitted from all emission points in the impacts evaluation, in µg/m^3.

GLC_{ni}— Maximum non-industrial off-property ground level concentration for the appropriate averaging time of the chemical species emitted from all emission points in the impacts evaluation, in µg/m^3.

long-term—An annual averaging period.

National Ambient Air Quality Standards (NAAQS)—Levels of air quality to protect the public health and welfare (40 Code of Federal Regulations (CFR) §50.2). Primary standards are set to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly from the effects of "criteria air pollutants" and certain non-criteria pollutants. Secondary standards are set to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

non-industrial receptor—A receptor type such as residential, recreational, commercial, business, agricultural, or a school, hospital, day-care center, or church. In addition, receptors in un-zoned or undeveloped areas are considered non-industrial. A receptor is a location where the public could be exposed to an air constituent in the ambient air.

refined modeling—An air dispersion model with refined input parameters including hourly meteorological data, multiple facilities, and facility locations. Ground level concentrations are determined across a receptor grid and are more representative of actual concentrations than those obtained from screen modeling.

screen modeling—A simple air dispersion model with limited input parameters that yields a conservative estimate of the ground level concentration for a single facility as a function of distance from the facility.

short term—A one-hour averaging period.

site—The total of all stationary sources located on one or more contiguous or adjacent properties, which are under common control of the same person (or persons under common control) (30 TAC § 122.10).

site-wide modeling—Modeling (refined or screening) of emissions from all emission points and areas on a contiguous property or at a site. Site-wide modeling includes all sources authorized under 30 TAC Chapters 106 and 116. Note that de minimis emissions under 30 TAC § 116.119 are not included for site-wide modeling demonstrations.

source—A point of origin of air contaminants, whether privately or publicly owned or operated (30 TAC § 116.10).

unit impact multiplier—An EPN specific factor derived by running a dispersion model with a unit emission rate of 1.0 lb/hr or 1.0 g/sec. The unit impact multiplier can be multiplied by the emission rate to determine the ground level concentration resulting from those emissions.

Appendix B: Toxicology Emissions Screening List

Emissions from the following facilities have been reviewed for health effects and are not expected to cause adverse health effects. These do not require additional review through the MERA process.

- Odor and particulate emissions from agricultural, food processing, or animal feeding or handling facilities.
- Emissions of particulates from abrasive blast cleaning provided they do not contain any of the following:
    - asbestos;
    - metals and metal compounds with an ESL of less than 50 µg/m3 that are in a concentration of greater than 2.0%; or
    - crystalline silica at greater than or equal to 1 percent (weight) of the total particulate weight.
- Emissions of particulate matter, except for metals, metal compounds, silica, from controlled surface coating operations. Controlled surface coating operations are those that capture and abate particulate matter with a water wash or dry filter system (at least 98% removal efficiency) and vent through an elevated stack with no obstruction to vertical flow.
- Emissions of particulate matter from rock crushers, concrete batch plants and soil stabilization plants.
- Emissions from boilers, engines, or other combustion units fueled only by pipeline-quality natural gas as well as emissions from the combustion of natural gas in control devices.
- Emissions from flares, heaters, thermal oxidizers, and other combustion devices burning gases only from onshore crude oil and natural gas processing plants, with the exception of emissions from glycol dehydrators and amine units.
- Emissions of volatile organic compounds from emergency diesel engines.
- Emissions of freons that have ESLs greater than 15,000 µg/m3 from any facility.
- Emissions of the following gases, which have been classified as simple asphyxiates, from any facility.
    - argon
    - carbon dioxide
    - ethane
    - helium
    - hydrogen
    - methane
    - neon
    - nitrogen
    - propane
    - propylene

Appendix C: Screening Tables

The screening tables are used to determine a conservative estimate of the ground level concentration of a chemical species from an emission point. These tables provide conservative unit impact multipliers for a particular emission point based upon the source's stack height and distance from the nearest property line. The following instructions apply to the selection and use of Tables 1 through 4:

- Utilize linear interpolation between height and distance parameters in the tables to determine a more accurate unit impact multiplier, if desired. Extrapolation with heights or distances greater than the values listed in the tables is not allowed.
- Assume that daytime hours are between 6 a.m. and 6 p.m.
- Determine if the source will be downwashed. Downwash is a term used to represent the potential effects of a structure on the dispersion of emissions from a source. If the source is downwashed, use Table 1 or 3; if the source is not downwashed, use Table 2 or 4. A source is downwashed if each of the three conditions below is satisfied.

    1. The source is characterized as a point source. Downwash does not apply to sources characterized as area or volume sources.
    2. The stack height of the source is less than the good engineering practice stack height (H_g). H_g is defined as the greater of:

        i. 65 meters, measured from the ground-level elevation at the base of the stack;

        ii. For stacks in existence on January 12, 1979 and the owner or operator had obtained all applicable permits or approvals required under 40 CFR parts 51 and 52:

        $$H_g = 2.5H$$

        where:

        H = structure height;

        iii. For all other stacks

        $$H_g = H + 1.5L$$

        where:

        L = the lesser of the structure height or maximum projected width (the width as seen from the source looking towards the nearest property line) of the structure; and

    3. The structure is sufficiently close to the stack, as defined when

        $$D \leq 5L,$$

        where:

        D = the distance between the structure and the stack.

If the source is located near more than one structure, determine downwash applicability with the structure whose dimensions result in the highest GEP stack height. This structure will cause the greatest downwash effects. Downwash may be applicable even in cases where the building is not between the source and the nearest property line.

Table 1. Downwash for All Hours ($\mu g/m^3$ per 1 lb/hr)

Distance from the Property Line (feet)	Stack Height (feet)																				
	3	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
50	2965	2363	2260	1005	596	362	251	185	141	112	90	75	63	54	46	40	35	31	28	25	23
100	2024	1719	1003	708	596	362	251	185	141	112	90	75	63	54	46	40	35	31	28	25	23
150	1338	1195	822	708	596	342	251	185	141	112	90	75	63	54	46	40	35	31	28	25	23
200	950	873	708	708	559	342	218	185	141	112	90	75	63	54	46	40	35	31	28	25	23
250	800	743	617	617	512	321	213	149	112	112	90	75	63	54	46	40	35	31	28	25	23
300	720	670	550	550	454	300	205	145	107	80	75	75	63	54	46	40	35	31	28	25	23
400	593	557	460	460	354	246	184	133	100	77	61	48	46	46	46	40	35	31	28	25	23
500	502	473	397	397	292	203	151	118	92	72	58	47	38	32	31	31	31	31	28	25	23
600	430	408	350	350	248	173	129	101	81	67	54	44	37	31	26	22	19	17	14	13	11
700	373	357	313	313	216	151	112	88	71	59	50	41	35	29	25	22	19	16	14	13	11
800	330	315	282	282	192	134	100	78	63	52	44	38	33	28	24	21	18	16	14	12	11
900	293	280	255	255	173	121	90	70	57	47	40	34	30	26	23	20	17	15	14	12	11
1000	262	252	233	233	157	110	82	64	52	43	36	31	27	24	21	19	17	15	13	12	11
1500	172	167	157	157	107	77	58	45	36	30	25	22	19	17	15	12	12	11	9.9	9.3	8.7
2000	122	120	117	117	80	58	44	35	28	23	20	17	15	13	11	10	9.2	8.4	7.8	7.3	6.8
2500	93	92	90	90	64	47	36	28	23	19	16	14	12	11	9.4	8.4	7.6	6.9	6.4	6	5.6
3000	75	73	72	72	52	39	30	24	20	16	14	12	10	9	8	7.1	6.4	5.8	5.5	5.1	4.8
4000	50	50	50	50	37	29	23	18	15	13	11	9.1	7.9	7	6.2	5.5	5	4.5	4.2	4	3.7
5000	37	37	37	37	29	23	18	15	12	10	8.7	7.5	6.5	5.7	5.1	4.5	4.1	3.7	3.4	3.2	3

Table 2. No Downwash for All Hours ($\mu g/m^3$ per 1 lb/hr)

Distance from the Property Line (feet)	Stack Height (feet)																				
	3	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
50	23773	2787	725	323	175	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
100	19785	2233	697	323	175	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
150	12608	1942	550	310	175	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
200	8458	1942	482	275	166	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
250	6040	1837	482	243	155	100	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
300	4531	1837	453	243	132	96	67	48	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
400	2838	1613	448	203	128	76	60	46	35	30	24	19	16	13	11	9.8	8.8	7.5	6.6	5.9	5.2
500	1958	1322	422	195	114	76	49	40	33	27	21	17	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
600	1440	1075	417	188	105	70	49	36	28	24	20	17	14	12	11	9.8	8.5	7.5	6.6	5.9	5.2
700	1110	885	417	188	105	64	48	36	27	21	18	16	14	12	9.9	8.7	7.9	7.5	6.6	5.9	5.2
800	888	738	402	180	100	64	44	36	27	21	17	14	13	11	9.8	8.5	7.4	6.6	6.1	5.6	5.2
900	728	625	377	170	95	64	43	33	27	21	17	14	12	10	9.3	8.3	7.3	6.5	5.7	5.2	4.8
1000	610	535	348	170	95	62	43	30	25	21	17	14	11	9.7	8.6	7.8	7	6.3	5.7	5	4.6
1500	308	287	228	157	83	52	36	29	22	17	17	14	11	9.6	8.3	7.1	6.1	5.5	5	4.6	4.2
2000	188	182	157	123	79	45	32	23	20	16	13	11	8.9	8.2	7.4	6.8	6.1	5.5	4.9	4.4	3.9
2500	130	127	113	97	68	44	27	21	16	14	12	10	8.8	7.3	6.2	5.7	5.3	4.9	4.6	4.2	3.9
3000	98	95	88	77	57	40	27	19	15	12	11	10	8.3	7.2	6.2	5.3	4.4	4.2	3.9	3.7	3.5
4000	62	62	58	53	42	31	23	17	12	10	8.4	7.4	6.7	6.1	5.5	4.9	4.4	3.8	3.4	2.9	2.6
5000	45	43	42	38	32	25	19	15	11	8.3	7.2	6.2	5.4	5	4.6	4.2	3.8	3.5	3.2	2.8	2.6

Table 3. Downwash for Daytime (μg/m³ per 1 lb/hr)

Distance from the Property Line (feet)	Stack Height (feet)																				
	3	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
50	2965	2363	2260	1005	565	362	251	185	141	112	90	75	63	54	46	40	35	31	28	25	23
100	2024	1719	1003	565	565	362	251	185	141	112	90	75	63	54	46	40	35	31	28	25	23
150	1338	1195	822	353	320	251	251	185	141	112	90	75	63	54	46	40	35	31	28	25	23
200	950	873	665	352	300	201	185	185	141	112	90	75	63	54	46	40	35	31	28	25	23
250	700	655	532	335	275	189	135	112	112	112	90	75	63	54	46	40	35	31	28	25	23
300	563	532	437	312	247	176	129	97	76	75	75	75	63	54	46	40	35	31	28	25	23
400	392	373	322	263	195	147	116	90	71	57	48	46	46	46	46	40	35	31	28	25	23
500	290	280	247	220	160	122	97	80	65	54	45	38	32	31	31	31	31	31	28	25	23
600	225	218	197	183	134	104	84	69	58	50	42	36	31	27	23	20	18	16	14	13	11
700	185	180	165	155	115	91	73	61	52	44	39	33	29	25	22	20	17	16	14	13	11
800	152	148	138	133	100	80	65	54	46	40	35	31	28	24	21	19	17	15	14	12	11
900	128	125	117	117	88	71	58	49	42	36	32	28	25	23	20	18	16	15	13	12	11
1000	110	108	102	102	77	63	53	44	38	33	29	26	23	21	19	17	16	14	13	12	11
1500	58	58	57	57	47	40	34	30	26	23	20	18	16	15	14	12	11	11	9.9	9.3	8.7
2000	37	37	37	37	31	27	24	21	19	17	15	14	13	12	11	9.7	9	8.3	7.8	7.3	6.8
2500	27	27	27	27	23	20	19	17	15	14	12	11	10	9.4	8.6	8	7.4	6.9	6.4	6	5.6
3000	20	20	20	20	18	16	15	14	12	11	10	9.3	8.6	7.9	7.3	6.7	6.3	5.8	5.5	5.1	4.8
4000	13	13	13	13	12	11	10	9.4	8.7	8	7.4	6.8	6.3	5.9	5.5	5.1	4.8	4.5	4.2	4	3.7
5000	9.3	9.3	9.3	9.3	8.6	8	7.5	7	6.5	6.1	5.7	5.3	4.9	4.6	4.3	4.1	3.8	3.6	3.4	3.2	3

Table 4. No Downwash for Daytime ($\mu g/m^3$ per 1 lb/hr)

Distance from the Property Line (feet)	Stack Height (feet)																				
	3	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
50	18738	2787	725	323	175	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
100	7657	1902	697	323	175	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
150	3983	1542	550	310	175	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
200	2445	1542	478	275	166	107	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
250	1662	1215	453	217	155	100	72	51	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
300	1207	962	453	212	132	96	67	48	38	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
400	727	633	402	195	116	75	60	46	35	30	24	19	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
500	488	445	327	195	105	73	49	40	33	27	21	17	16	13	11	9.8	8.5	7.5	6.6	5.9	5.2
600	353	330	263	182	105	68	49	36	28	24	20	17	14	12	11	9.8	8.5	7.5	6.6	5.9	5.2
700	268	255	215	162	105	64	48	36	27	21	18	16	14	12	9.9	8.7	7.9	7.5	6.6	5.9	5.2
800	212	203	177	142	100	64	44	36	27	21	17	14	13	11	9.8	8.5	7.4	6.6	6.1	5.6	5.2
900	172	167	148	123	92	64	43	33	27	21	17	14	12	10	9.3	8.3	7.3	6.5	5.7	5.2	4.8
1000	142	138	127	108	84	62	43	30	25	21	17	14	11	9.7	8.6	7.8	7.0	6.3	5.7	5.0	4.6
1500	70	70	67	62	53	45	36	29	22	17	17	14	11	9.6	8.3	7.1	6.1	5.5	5.0	4.6	4.2
2000	43	43	42	40	36	31	27	23	20	16	13	11	8.9	8.2	7.4	6.8	6.1	5.5	4.9	4.4	3.9
2500	30	28	28	28	25	23	21	19	16	14	12	10	8.8	7.3	6.2	5.7	5.3	4.9	4.6	4.2	3.9
3000	22	22	22	20	19	18	16	15	13	12	11	10	8.3	7.2	6.2	5.3	4.4	4.2	3.9	3.7	3.5
4000	14	14	13	13	12	12	11	10	9.4	8.7	8.0	7.4	6.7	6.1	5.5	4.9	4.4	3.8	3.4	2.9	2.6
5000	9.5	9.5	9.3	9.3	8.9	8.4	7.9	7.5	7.1	6.6	6.2	5.8	5.4	5.0	4.6	4.2	3.8	3.5	3.2	2.8	2.6

Appendix D: Toxicology Effects Evaluation Procedure

A three-tiered approach is used to evaluate the health and welfare effects of chemical species that undergo site-wide modeling. A GLCmax based on the project emission increase rather than site-wide emissions cannot be evaluated under these criteria. These tiers should be used to evaluate both short-term and long-term GLCmax values. In describing the results of an effects evaluation, the terms below are used.

- ***Acceptable*** - adverse health or welfare effects would not be expected as a result of exposure to a given constituent concentration.
- ***Allowable*** - the permit engineer has provided justification to the Toxicology Division that the predicted GLCs are not likely to occur or that they occur in a location where public access is limited.

Tier I: Is the off-property GLC_{max} below the ESL?

- **If "Yes" → the impacts are acceptable.**
- **If "No" → Tier II.**

Tier II: Are both of the following conditions met?

1. $GLC_{max} \leq 2 \times ESL$

   where:

   the GLC_{max} occurs on industrial use property

2. The $GLC_{ni} < ESL$

   where:

   the GLC_{ni} is the ground-level concentration at the maximally affected, off-property, nonindustrial receptor.

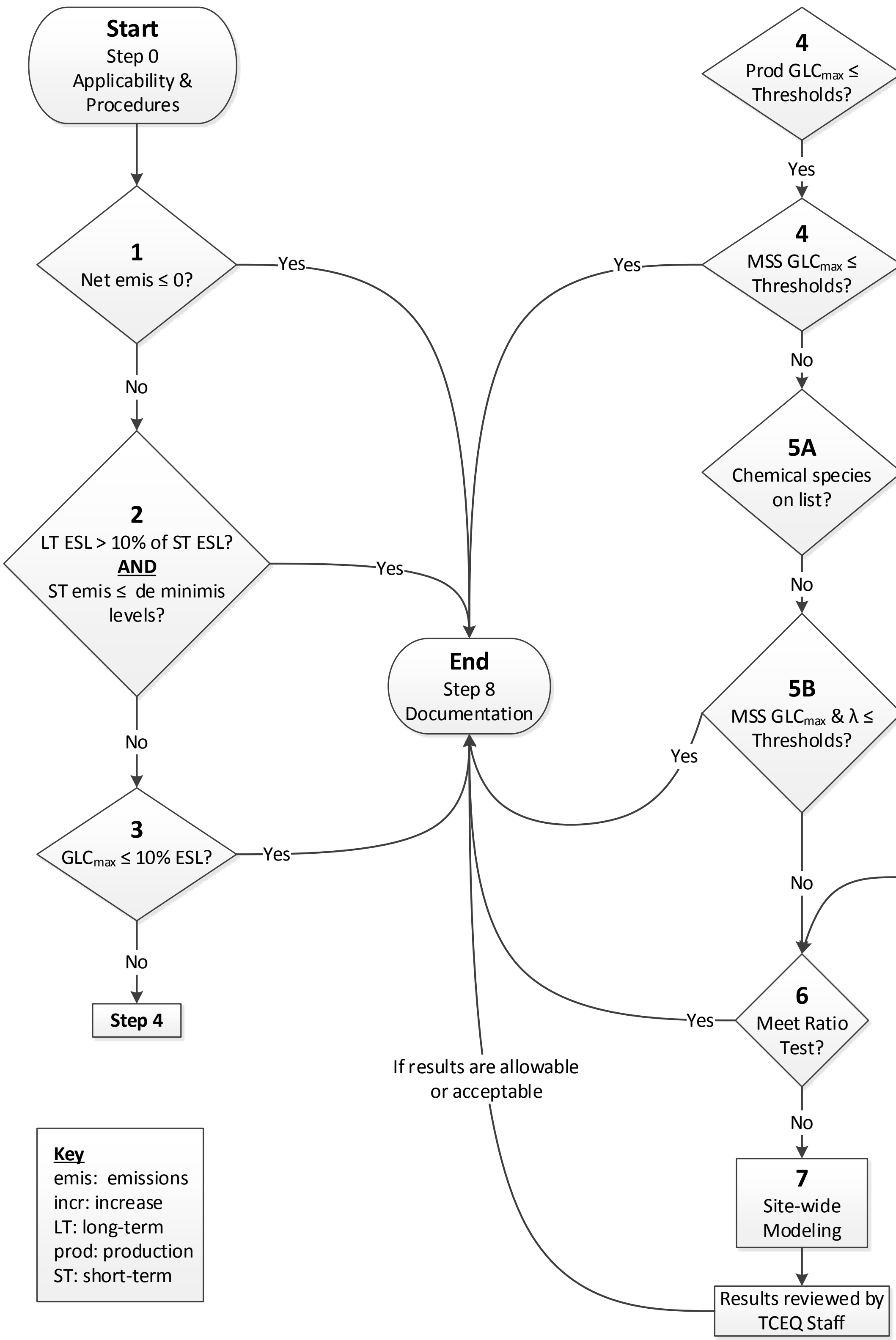
- **If "Yes" → the impacts are acceptable.**
- **If "No" → Tier III**

Tier III: The Toxicology Division will conduct a case-by-case review of the health and welfare effects of the chemical species to determine if the impacts are acceptable, unacceptable, or allowable. The Toxicology Division may consider the following factors.

- Surrounding land use
- GLC_{max} and its frequency of exceedance
- Magnitude of the GLC_{ni}
- Potential for public exposure
- Conservatism of the approach use to determine the GLC_{max}
- Existing concentrations of the chemical species
- Basis of ESL (odor vs. health, degree of confidence, margin of safety)
- Acceptable reductions in existing GLCs

This information is analyzed by the toxicologist to develop a final determination on the likelihood that emissions will increase the risk of adverse health or welfare effects.

Appendix E: MERA Flowchart



This flowchart is a summary of the MERA and is not intended to be a substitute for this guidance.

Appendix C

MERA Analysis

SUMMARY OF SPECIATED POLLUTANTS

EPN *	Source	Mode	Polllutant	CAS	Max Hourly (lb/hr)	Annual (tpy)	Lat	Long	Distance to Property Line (ft)	Stack Height (ft)	X (µg/m^3/(lb/hr)	ST GLC (µg/m^3)	LT GLC (µg/m^3)
M-1	Marine Loading	Routine	Benzene	71-43-2	0.44669	0.91801	28.527	-95.028	1638	65.62	30.65	13.69295	6.42488
		Routine	Isopropylbenzene	98-82-8	0.00342	0.00703						0.10481	0.04918
		Routine	Ethylbenzene	100-41-4	0.02996	0.06156						0.91826	0.43086
		Routine	n-Hexane	110-54-3	2.31185	4.75118						70.86785	33.25194
		Routine	2,2,4-Trimethylpentane (isooctane)	540-84-1	0.03844	0.07900						1.17832	0.55288
		Routine	Toluene	108-88-3	0.21866	0.44937						6.70277	3.14501
		Routine	m-Xylene	108-38-3	0.08765	0.18013						2.68681	1.26068
G-1	Generator 1	Routine	Acetaldehyde	75-07-0	0.00017	0.00075	28.555	-95.028	1638	20	145.96	0.02492	0.02492
		Routine	Benzene	71-43-2	0.00526	0.02303						0.76748	0.76748
		Routine	Formaldehyde	50-00-0	0.00053	0.00234						0.07803	0.07803
		Routine	Toluene	108-88-3	0.00190	0.00573						0.27792	0.19088
		Routine	m-Xylene	108-38-3	0.00190	0.00573						0.27792	0.19088
G-2	Generator 2	Routine	Acetaldehyde	75-07-0	0.00017	0.00075	28.555	-95.028	1638	20	145.96	0.02492	0.02492
		Routine	Benzene	71-43-2	0.00526	0.02303						0.76748	0.76748
		Routine	Formaldehyde	50-00-0	0.00053	0.00234						0.07803	0.07803
		Routine	Toluene	108-88-3	0.00190	0.00573						0.27792	0.19088
		Routine	m-Xylene	108-38-3	0.00190	0.00573						0.27792	0.19088
C-1	Crane 1	Routine	Formaldehyde	50-00-0	0.00351	0.01538	28.555	-95.028	1638	40	81.896	0.28750	0.28750
T-1	Surge Tank	Routine	Benzene	71-43-2	0.00176	0.00770	28.555	-95.028	1638	30	147.616	0.25942	0.25942
		Routine	Ethylbenzene	100-41-4	0.00012	0.00052						0.01740	0.01740
		Routine	n-Hexane	110-54-3	0.00910	0.03984						1.34263	1.34263
		Routine	Toluene	108-88-3	0.00086	0.00377						0.12699	0.12699
		Routine	m-Xylene	108-38-3	0.00034	0.00151						0.05090	0.05090
P-1	MSS - Pigging Operations (12 hours/year)	MSS	Benzene	71-43-2	0.36951	0.00222	28.555	-95.028	1638	3.28	274.20	101.32079	0.13880
		MSS	n-Hexane	110-54-3	1.91239	0.01147						524.38543	0.71834
		MSS	Toluene	108-88-3	0.18088	0.00109						49.59704	0.06794
F-1	Platform Fugitive Emissions	Routine	Benzene	71-43-2	0.00016	0.00071	28.555	-95.028	1638	3.28	274.20	0.04421	0.04421
		Routine	n-Hexane	110-54-3	0.00052	0.00227						0.14236	0.14236
		Routine	Toluene	108-88-3	0.00027	0.00118						0.07369	0.07369
		Routine	m-Xylene	108-38-3	0.00038	0.00165						0.10316	0.10316
UM-1	Uncontrolled Marine Loading (Bad Weather) (18 hours/year)	MSS	Benzene	71-43-2	15.88778	0.13687	28.554	-95.028	450	65.62	48.04	763.25984	1.50120
		MSS	Isopropylbenzene	98-82-8	0.12161	0.00105						5.84210	0.01149
		MSS	Ethylbenzene	100-41-4	1.06545	0.00918						51.18479	0.10067
		MSS	n-Hexane	110-54-3	82.22717	0.70836						3950.24907	7.76946
		MSS	2,2,4-Trimethylpentane (isooctane)	540-84-1	1.36719	0.01178						65.68083	0.12918
		MSS	Toluene	108-88-3	7.77715	0.06700						373.61959	0.73485
		MSS	m-Xylene	108-38-3	3.11747	0.02686						149.76559	0.29456
GT-1	GT Generator 1	Routine	1,3-Butadiene	106-99-0	0.00003	0.00002	28.523	-95.028	450	49.21	79.54	0.00247	0.00042
		Routine	Acetaldehyde	75-07-0	0.00289	0.00215						0.22960	0.03905
		Routine	Acrolein	107-02-8	0.00046	0.00034						0.03674	0.00625
		Routine	Benzene	71-43-2	0.00087	0.00065						0.06888	0.01171
		Routine	Ethylbenzene	100-41-4	0.00231	0.00172						0.18368	0.03124
		Routine	Formaldehyde	50-00-0	0.05123	0.03817						4.07533	0.69310
		Routine	Naphthalene	91-20-3	0.00009	0.00007						0.00746	0.00127
		Routine	PAH	130498-29-2	0.00016	0.00012						0.01263	0.00215
		Routine	Propylene Oxide	75-56-9	0.00209	0.00156						0.16646	0.02831
		Routine	Toluene	108-88-3	0.00938	0.00699						0.74619	0.12691
		Routine	m-Xylene	108-38-3	0.00462	0.00344						0.36735	0.06248

SUMMARY OF SPECIATED POLLUTANTS (cont'd)

EPN *	Source	Mode	Polllutant	CAS	Max Hourly (lb/hr)	Annual (tpy)	Lat	Long	Distance to Property Line (ft)	Stack Height (ft)	X ($\mu g/m^3$/(lb/hr))	ST GLC ($\mu g/m^3$)	LT GLC ($\mu g/m^3$)
GT-2	GT Generator 2	Routine	1,3-Butadiene	106-99-0	0.00003	0.00002	28.523	-95.028	450	49.21	79.54	0.00247	0.00042
		Routine	Acetaldehyde	75-07-0	0.00289	0.00215						0.22960	0.03905
		Routine	Acrolein	107-02-8	0.00046	0.00034						0.03674	0.00625
		Routine	Benzene	71-43-2	0.00087	0.00065						0.06888	0.01171
		Routine	Ethylbenzene	100-41-4	0.00231	0.00172						0.18368	0.03124
		Routine	Formaldehyde	50-00-0	0.05123	0.03817						4.07533	0.69310
		Routine	Naphthalene	91-20-3	0.00009	0.00007						0.00746	0.00127
		Routine	PAH	130498-29-2	0.00016	0.00012						0.01263	0.00215
		Routine	Propylene Oxide	75-56-9	0.00209	0.00156						0.16646	0.02831
		Routine	Toluene	108-88-3	0.00938	0.00699						0.74619	0.12691
		Routine	m-Xylene	108-38-3	0.00462	0.00344						0.36735	0.06248
EDG-1	CAT 3516C - No. 1	Routine	Acetaldehyde	75-07-0	0.00018	0.00078	28.523	-95.028	450	20	435	0.07768	0.07768
		Routine	Benzene	71-43-2	0.00550	0.02409						2.39202	2.39202
		Routine	Formaldehyde	50-00-0	0.00056	0.00245						0.24321	0.24321
		Routine	Toluene	108-88-3	0.00199	0.00872						0.86618	0.86618
		Routine	m-Xylene	108-38-3	0.00137	0.00599						0.59492	0.59492
EDG-3	CAT 3512C - No. 1	Routine	Acetaldehyde	75-07-0	0.00003	0.00011	28.523	-95.028	450	20	435	0.01094	0.01094
		Routine	Benzene	71-43-2	0.00077	0.00339						0.33697	0.33697
		Routine	Formaldehyde	50-00-0	0.00008	0.00034						0.03426	0.03426
		Routine	Toluene	108-88-3	0.00028	0.00123						0.12202	0.12202
		Routine	m-Xylene	108-38-3	0.00019	0.00084						0.08381	0.08381
F-1	OSV Fugitive Emissions	Routine	Benzene	71-43-2	0.00015	0.00065	28.523	-95.028	450	3.28	2360.67	0.34932	0.34932
		Routine	Isopropylbenzene	98-82-8	0.00002	0.00011						0.05822	0.05822
		Routine	Ethylbenzene	100-41-4	0.00010	0.00043						0.23288	0.23288
		Routine	n-Hexane	110-54-3	0.00048	0.00209						1.12482	1.12482
		Routine	2,2,4-Trimethylpentane (isooctane)	540-84-1	0.00002	0.00011						0.05822	0.05822
		Routine	Toluene	108-88-3	0.00025	0.00108						0.58221	0.58221
		Routine	m-Xylene	108-38-3	0.00035	0.00151						0.81509	0.81509
F-2	OSV Fugitive Emissions - Hose Disconnects	Routine	Benzene	71-43-2	0.00171	0.00015	28.523	-95.028	450	3.28	2360.67	4.03050	0.08282
		Routine	Isopropylbenzene	98-82-8	0.00001	0.00000						0.03085	0.00063
		Routine	Ethylbenzene	100-41-4	0.00011	0.00001						0.27029	0.00555
		Routine	n-Hexane	110-54-3	0.00884	0.00080						20.85986	0.42863
		Routine	2,2,4-Trimethylpentane (isooctane)	540-84-1	0.00015	0.00001						0.34684	0.00713
		Routine	Toluene	108-88-3	0.00084	0.00008						1.97295	0.04054
		Routine	m-Xylene	108-38-3	0.00034	0.00003						0.79086	0.01625

MERA STEPS 1-3

										SHORT-TERM (ST)			LONG-TERM (LT)		
Polllutant	CAS	Total	ST ESL	LT ESL	ST ESL Deminimis Limit	ST ESL Deminimis Applicability	IS LT ESL >=10 % of ST ESL	STEP-2	MERA ANALYSIS	ST GLCmax	ST STEP-3	ST MERA ANALYSIS	LT GLCmax	LT STEP-3	LT MERA ANALYSIS
		(lb/hr)	ug/m3	ug/m3	lb/hr	ug/m3	YES/NO	YES/NO	PROCEED/END	ug/m3	YES/NO	PROCEED/END	ug/m3	YES/NO	PROCEED/END
Ethylbenzene	100-41-4	1.1004	26000	570	0.4	No	NO	NO	STEP 3	52.991	YES	END	0.850	YES	END
1,3-Butadiene	106-99-0	0.0001	510	9.9	0.1	Yes	NO	NO	STEP 3	0.005	YES	END	0.001	YES	END
Acrolein	107-02-8	0.0009	3.2	0.82	0.04	Yes	YES	YES	END						
m-Xylene	108-38-3	3.2211	2200	180	0.1	No	NO	NO	STEP 3	156.182	YES	END	3.726	YES	END
Toluene	108-88-3	8.2037	4500	1200	0.4	No	YES	NO	STEP 3	435.712	YES	END	6.395	YES	END
n-Hexane	110-54-3	86.4703	5600	200	0.4	No	NO	NO	STEP 3	4568.972	NO	STEP 4	44.778	NO	STEP 4
PAH	130498-29-2	0.0003	0.5	0.05	0	No	YES	NO	STEP 3	0.025	YES	END	0.004	YES	END
Formaldehyde	50-00-0	0.1077	15	3.3	0.04	No	YES	NO	STEP 3	8.872	NO	STEP 4	2.107	NO	STEP 4
2,2,4-Trimethylpentane (isooctane)	540-84-1	1.4058	5600	540	0.4	No	NO	NO	STEP 3	67.264	YES	END	0.747	YES	END
Benzene	71-43-2	16.7263	170	4.5	0.04	No	NO	NO	STEP 3	887.359	NO	STEP 4	13.088	NO	STEP 4
Acetaldehyde	75-07-0	0.0063	120	45	0.04	Yes	YES	YES	END						
Propylene Oxide	75-56-9	0.0042	70	7	0.04	Yes	YES	YES	END						
Naphthalene	91-20-3	0.0002	440	50	0.04	Yes	YES	YES	END						
Isopropylbenzene	98-82-8	0.1251	650	250	0.1	No	YES	NO	STEP 3	6.036	YES	END	0.120	YES	END

MERA STEP 4 - PRODUCTION ONLY

			SHORT-TERM (ST)				LONG-TERM (LT)			
Polllutant	CAS	Total	ST ESL	ST GLCmax	IS ST GLCmax >=10 % of ST ESL	STEP 4 MERA ANALYSIS	LT ESL	LT GLCmax	IS LT GLCmax >=10 % of ST ESL	STEP 4 MERA ANALYSIS
		(lb/hr)	ug/m3	ug/m3	YES/NO		ug/m3	ug/m3	YES/NO	
n-Hexane	110-54-3	2.3308	5600	94.3375	NO	STEP 5	200	36.2904	YES	STEP 6
Formaldehyde	50-00-0	0.1077	15	8.8717	YES	STEP 6	3.3	2.1072	YES	STEP 6
Benzene	71-43-2	0.4690	170	22.7781	YES	STEP 6	4.5	11.4480	YES	STEP 6

MERA - STEP 5 - MSS

			SHORT-TERM (ST)				LONG-TERM (LT)			
Polllutant	CAS	Total	ST ESL	ST GLCmax	IS ST GLCmax >=25 % of ST ESL	STEP 5 MERA ANALYSIS	LT ESL	LT GLCmax	IS LT ESL >=25 % of ST ESL	STEP 5 MERA ANALYSIS
		(lb/hr)	ug/m3	ug/m3	YES/NO		ug/m3	ug/m3	YES/NO	
n-Hexane	110-54-3	84.1396	5600	4474.6345	YES	END	200	8.4878	NO	STEP 6
Formaldehyde	50-00-0	0	15	0	NO	STEP 6	3.3	0	NO	STEP 6
Benzene	71-43-2	16.2573	170	864.5806	YES	STEP 6	4.5	1.6400	NO	STEP 6

MERA - STEP 6 - PRODUCTION & MSS

		SHORT-TERM (ST)					LONG-TERM (LT)				
Polllutant	CAS	ST ESL	ST GLCmax	ERp	ERs	STEP 6 MERA ANALYSIS	LT ESL	LT GLCmax	ERp	ERs	STEP 6 MERA ANALYSIS
		ug/m3	ug/m3	lb/hr	lb/hr		ug/m3	ug/m3	lb/hr	lb/hr	
n-Hexane	110-54-3						200	36.2904	5.5160	5.5160	END
Formaldehyde	50-00-0	15	8.8717	0.1077	0.1077	END	3.3	2.1072	0.0992	0.0992	END
Benzene	71-43-2	170	887.3588	16.7263	16.7263	STEP 7	4.5	11.4480	1.1411	1.1411	STEP 7